

Audit Specifications Template for Multifamily Existing Buildings

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Purpose of this Template

This Audit Specifications Template is intended for use by multifamily whole-house retrofit programs in California. This template:

- *Describes best practices for conducting whole-house performance based energy, water and green building audits of multifamily buildings, and*
- *Provides sample language that retrofit programs can use to create their own customized Multifamily Audit Specifications or Audit Protocol document.*

Instructions for using this template are in italics. These instructions are not meant to be duplicated in a retrofit program's specifications or protocol document. Sample language intended for use in retrofit program documents are in plain (non-italic) text.

Multifamily Performance Program Introduction

In this section, provide an overview of the multifamily whole-house performance program to which these Audit Specifications pertain. Include:

- *Program title, brief description and summary of benefits of participation in the retrofit program*
- *Relationship between the retrofit program and these Audit Specifications*
- *Major components of the Audit*
- *Expected outcomes of the Audit*

Sample language for program introduction:

This document contains Audit Specifications for conducting multifamily whole-house energy performance retrofits. Adherence to these specifications is required for eligibility for [Program Name]. For details on the [Program Name] and benefits of participation, refer to [Program document name or website].

[Program Name's] Audit process consists of three main steps: the site visit, building energy modeling and utility analysis, and reporting.

The site visit, modeling and analysis will result in a report that documents the site's current physical conditions and energy and water use; recommendations for energy and water conservation measures and green building improvements; cost/benefit analyses for each recommended measure; and other details described in the Audit Report section of this document.

Audit Objectives

In this section, clearly define the [Program Name] audit objectives. These objectives are likely to vary by program. Sample language for various audit objectives follows.

Investment Grade Audit¹

An Investment Grade Audit is of a caliber such that its data and analysis is deemed reliable to take on the risk of lending money to the project. The investment grade audit protocol defines the required criteria for an audit to be used by loan underwriters to determine if energy and water conservation measures can be put in place to save enough money to pay for debt service that finances all, or some portion of, the improvements.

¹ See Investment Grade Audit Protocol defined in SF Mayor's Office of Housing, Enterprise Community Partners & Low Income Investment Fund's "San Francisco Bay Area Multifamily Retrofit Initiative." [NEED LINK TO DOCUMENT]

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The Audit process will:

- Conduct a comprehensive analysis that identifies all reasonable opportunities for energy and water conservation savings, including equipment and system retrofits and replacement and operations and maintenance improvements.
- Gather data from diagnostic field tests and extensive site analysis. This may include visual inspection, building systems testing, spot measurements and short-term energy monitoring.
- Conduct an evaluation of the building's integrity to identify any deficiencies that could result in health and safety hazards to residents, code violations, and/or degradation of building systems that jeopardize the long-term viability of the building over a minimum ten-year horizon.
- Conduct an intensive engineering and economic analysis to produce reliable estimates of the project's energy and financial performance with the high confidence needed for major capital projects.

Portfolio of Measures with Positive NPV

The Audit process will:

- Identify and quantify specific opportunities for energy savings that, taken together as a portfolio of measures, will provide a positive net present value (NPV).

Performance Improvement Targets

The Audit may be tied to tiered program performance targets such as these sample objectives.

The Audit process will:

- Identify and quantify specific opportunities to achieve a minimum 10% reduction in whole-building energy use by specifying a portfolio of measures defined by the Title 24 Residential HERS II energy end uses of space heating, space cooling, water heating, fans, pumps, lighting and appliances (including solar pre-heat systems).
- Identify and quantify specific opportunities to achieve a minimum 40% reduction in whole-building energy use by specifying a portfolio of measures defined by the Title 24 Residential HERS II energy end uses of space heating, space cooling, water heating, fans, pumps, lighting and appliances (including solar pre-heat systems).
- Identify and quantify specific opportunities to meet the remaining 60% of energy use by on-site generation or renewable energy.

Incremental Upgrades

Improvements to existing buildings tend to be made incrementally. It is often necessary for a retrofit analysis to take into account all improvements that have been or will be made to a building over time. Here is sample language for incremental upgrades in two specific approaches.

- Identify and quantify specific opportunities for building upgrades undertaken and planned over time. A mechanism specific to HUD-subsidized affordable housing projects is the Property Condition Assessment (PCA), also commonly referred to as a Property Needs Assessment (PNA). Some multifamily energy audits will be conducted in conjunction with a Green PCA/PNA.²
- Identify and quantify specific opportunities for building upgrades undertaken and planned over time, in addition to achieving a minimum 10% reduction in whole-building energy, by meeting the GreenPoint Rated Existing Home Multifamily (GPR EHMf) program's minimum energy efficiency standard for improvement which varies depending on the building's age. The building with the proposed improvements must exceed the baseline energy efficiency of the same building

² See "Green Rehabilitation of Multifamily Rental Properties" by LIISC, HUD Green Retrofit Program, or Enterprise Green Communities.

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modeled with the default energy efficiency measures for the vintage of the building by at least these percentages:

Age of building	% improvement	Compared to
Pre-1980	25%	Baseline building
1980–2000	15%	Baseline building
2001–2005	10%	Title 24 2001
2005–2009	10%	Title 24 2005
2010–current	10%	Title 24 2008

Comprehensive Energy Efficiency and Green Measures³

The Audit process will:

- Identify all green measures, in addition to energy efficiency, on-site generation and water efficiency, that improve comfort and indoor air quality, create a safer and quieter home environment for the residents and property management workers, reduce the property’s negative impact on the environment, and have a lower incremental cost of implementation if undertaken at the time of other retrofit work.

Building Type Definitions

These Audit Specifications apply to multifamily buildings in California. Multifamily buildings are categorized as follows:

- **Low-rise Multifamily:** Three or more attached dwelling units with less than four habitable stories.
- **High-rise Multifamily:** Three or more attached dwelling units with four or more habitable stories.
- **Mixed-use Multifamily:** Three or more attached dwelling units as well as non-residential spaces within one building envelope.
- **Small Multifamily:** Three to four attached dwelling units within a building configured as a single-family home (such as a Victorian house converted into multiple apartments), to which single-family protocols are appropriately applied on a case-by case basis.

These categories can be further disaggregated by ownership structure and metering configuration (central vs. individual). Although these subcategories may impact the decision-making process for energy improvements, for the purpose of conducting the Audit, the primary distinction is in the multifamily sub-categories described above and between residential and nonresidential spaces:

- **Residential Spaces:** These Audit Specifications are consistent with California Whole Home Performance Report and Rating procedures, which currently apply to low-rise residential buildings including single family and multifamily buildings with fewer than four habitable stories. They are also consistent with audit methods presented in the Building Performance Institute’s “Technical Standards for the Multifamily Building Analyst Professional.”

Dwelling units in high-rise multifamily buildings are treated similarly to low-rise multifamily buildings, as defined by the energy improvement requirements of the GreenPoint Rated Existing Home Multifamily program.

³ See California’s GreenPoint Rated Existing Home Multifamily retrofit program for a comprehensive list of Green Measures and Rater Verification protocols.

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- **Nonresidential Spaces:** The ASHRAE Level 2 Energy Survey and Analysis, as specified in “Procedures for Commercial Building Energy Audits” (2004), shall be used for the Audit.⁴

Reference Standards

These Audit Specifications are derived from the following reference standards:

- Title 24 Standards for Residential and Non-residential Buildings (2008)
- HERS II Technical Manual (2008)
- Building Performance Institute, Inc., Technical Standards for Multifamily Building Analysts (2008)
- HUD, Energy Conservation for Housing: A Workbook (1998)
- RESNET, RESNET Standards, Chapter Seven, Comprehensive Home Energy Audit
- ASHRAE, Commercial Building Audit Standards (2004)
- Enterprise San Francisco Bay Area Affordable Multifamily Retrofit Initiative Audit Protocol
- City of Berkeley Money For Energy Efficiency Audit Standard
- GreenPoint Rated Existing Home Multifamily program

Audit Team Qualifications and Responsibilities

Auditor Qualifications

The Auditor shall have minimum qualifications as specified in the tables below. To fulfill the tasks listed in these tables, the Auditor may assemble multi-disciplinary teams consisting of employees or contracted partners. The Auditor shall ensure that its personnel and any contractors assigned to perform services have the necessary qualifications, licensing, bonding, insurance, competence, skill sets and experience required to fulfill their respective responsibilities.

Required Auditor qualifications for all multifamily projects

Tasks	Minimum Qualifications
Energy modeling and utility data analysis	California Association of Building Energy Consultants (CABEC) Certified Energy Plans Examiner (CEPE)
Whole building energy audit and recommendations	<ul style="list-style-type: none">• HERS II Rater• California Multifamily Retrofit Training, including Building Performance Institute (BPI) Multifamily Building Analyst curriculum
Combustion appliance safety	BPI Building Analyst

⁴ This document and the table templates are available from ASHRAE at: [https://eweb.ashrae.org/eweb/DynamicPage.aspx?Site=ASHRAE&WebKey=69c74d61-facd-4ca4-ad83-8063ea2de20a&listwhere=\(prd_etab_ext%20LIKE%20%2590426%25\)](https://eweb.ashrae.org/eweb/DynamicPage.aspx?Site=ASHRAE&WebKey=69c74d61-facd-4ca4-ad83-8063ea2de20a&listwhere=(prd_etab_ext%20LIKE%20%2590426%25)).

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Required Auditor qualifications depending on scope

Tasks	Minimum Qualifications
HVAC system efficiency and balancing (including duct testing)	HERS Rater
Central domestic water heating and distribution system efficiency	<ul style="list-style-type: none">• C-4 Plumbing or C-6 boiler contractor license• In Development Green CDHW Training
Assess building for water efficiency, resource conservation and IAQ measures	GreenPoint Rated Existing Home Multifamily Rater
Feasibility of renewable energy installation	Construction Specifications Institute (CSI) approved contractor
Analyze financial data and construction cost	Construction Cost Estimator
Energy audit and recommendations for nonresidential spaces > 20% floor area	ASHRAE II Auditor
Commissioning and retro-commissioning	Commissioning Agent
Operations and maintenance	BPI Multifamily Building Operator or National Affordable Housing Management Association (NAHMA) Green Building Operator

Auditor Responsibilities

- **Performance:** Complete the work and provide the deliverables as specified in these Audit Specifications.
- **Materials:** Auditor will obtain and/or provide any and all equipment required to provide the Audit services, such as computers, cameras, thermal imaging devices, software, data loggers, meters, measuring devices, pressure gauges and blower doors.
- **Methods:** Auditor shall comply with all local safety and security requirements and perform all onsite work in coordination with the designated local point of contact.
- **Auditor Conduct Standards:** Residential Auditors shall comply with applicable professional standards for ethics as defined by the Building Performance Institute Code of Ethics. Nonresidential Auditors shall comply with the ASHRAE Code of Ethics (www.ashrae.org/publications/detail/16451).
- **Representation:** An officer or owner of the firm conducting the Audit shall certify in writing that the Audit meets these Audit Specifications without exception, unless specifically exempted, and that the final Audit Report has been reviewed for quality assurance purposes by a principal or officer of the firm.

Building Owner/Client Responsibilities

The property owner or client is responsible for providing the following, if requested by the Auditor:

- Available mechanical and electrical as-built drawings
- Available energy management and control system documentation and drawings
- Energy cost and use data or authorization to obtain such data from the utility company (or reasonable efforts to acquire residents' billing data or authorizations), including:
 - Utility service agreement identification numbers for all gas and electric service
 - One year of client's monthly building natural gas and electric utility data
 - One year of client's building 15-minute electric interval data, if applicable
- Facility access within 48 hours of request from Auditor staff for data collection
- Turnaround time of two working days for response to Auditor's inquiries

Sampling Protocol

All nonresidential spaces shall be audited.

For residential spaces, sampling shall be conducted in accordance with Section 8.4.2 of the California Title 24–2008 Residential Compliance Manual, wherein at least one in seven of every unit type (defined as having same/similar floor plan) shall be inspected, with representation from differing building floors and including all four building orientations.

In no case shall the inspection include less than 10% of the total number of residential units. A larger sampling may be necessary depending on special circumstances. The Auditor shall ensure that a discussion of unit sampling with the owner or owner’s representative addresses special building circumstances that may result in an increased level of unit inspections and testing.

If the project is comprised of multiple buildings, the whole building-simulation shall include at least one example of each building type.

Site Visits⁵

The purpose of the site visit is to collect all necessary information to conduct an appropriate energy, water, health and environmental analysis, including sufficient information to inform an energy model. The Audit shall include an in-person visit to the project site by a qualified Auditor to complete the following tasks:

1. Preparation, scheduling and tenant notification
2. Interviews of owners and managers
3. Safety and code observations
4. Visual inspections and diagnostic testing to evaluate the efficiency and condition of the building envelope and systems

1. Site Visit Preparation, Scheduling and Tenant Notification

- Auditor shall complete the site preparation tasks as described in the Project Information Form.
- Auditor shall review [*Program Name’s*] initial screening report for the site, which establishes the building’s eligibility to participate in the program.
- Auditor shall review 12 months of prior utility bills (including gas, electric and water) to know annual utility cost by fuel type and seasonal variations. ⁶
- Auditor shall review as-built drawings (if available) and any other pertinent information about the site, the building and its systems, to be provided by the property owner or owner’s representative. ⁷
- Auditor shall schedule the site visits with the owner’s representative at a time convenient for that person. The site visit shall seek to cause minimal disruption to the project’s residents and neighbors.
- The property owner shall notify residents whose units will be inspected as part of the Audit. This notification shall be the sole responsibility of property owner or their representative.

2. Project Interviews⁸

The Auditor shall interview at least one of the following persons prior to or at the time of the site visit:

- Property manager

⁵ Refer to section 3.5 of Building Performance Institute’s (BPI) Multi Family Building Analyst Professional technical standards.

⁶ BPI 1.7.

⁷ BPI 1.8.

⁸ BPI 1.9-1.13.

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- Maintenance director or maintenance staff
- Owner or owner's representative

The purpose of the interviews is to:

- Discuss the Audit's objectives and the client's goals for the scope of retrofit
- Discuss building characteristics, existing documentation, and project energy and water performance
- Discuss residents' comfort, health and safety and agree on an approach to accessing residents for interview and to view dwelling unit spaces for the site visit. If any interviewee wishes their responses to remain confidential, the Auditor shall respect those requests.
- Discuss operations and maintenance procedures, including but not limited to the issues listed in the Project Information Form
- Address any other stakeholder questions or concerns

3. Safety and Code Observations⁹

If, during the course of the site visit, the Auditor observes a condition issue that, in his or her judgment, may be a building code violation or a potential threat to health or safety, the Auditor shall immediately notify the designated persons in the project application and/or any individuals that are present representing the owner.

4. Visual Inspection and Diagnostic Testing

The site visit shall involve visual inspections and diagnostic testing of the building envelope, and HVAC, combustion safety and lighting systems.¹⁰ The Auditor shall identify and record equipment specifications listed on the Project Information Form. The equipment specifications will be used in the energy modeling and analysis phase of the Audit. All Items listed in Diagnostic Testing Reference form, as applicable, shall be performed during the site visits.

Mandatory Measures

The Audit shall include observation and recommendations for implementation of the mandatory building retrofit measures listed here and described in more detail below.

- Prescriptive weatherization
- Combustion appliance safety test
- Duct leakage test

Mandatory Prescriptive Weatherization

As part of the Audit, during the site visit the Auditor shall document opportunities to improve the building envelope by:

- Installing weather stripping on all doors or hatches that lead from conditioned to unconditioned space.
- Sealing accessible duct joints with approved mastic or foil tape and insulating to at least R-4.2.
- Installing or repairing dampers doors or other devices to obstruct or block air flow to reduce heat loss through chimneys.
- Repairing or replacing visible envelope leaks, including pipe and conduit cuts, window sashes and glass, caulking around frames, sills and other linear joints.

Because of the cost, technical complexity and limited data to process results from blower door envelope leakage tests, these tests are not required on multifamily properties. Accordingly, prescriptive envelope weatherization measures are not claimed for credit in the energy performance model.

⁹ BPI 3.4.

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Mandatory Combustion Appliance Safety Test

In any sampled unit with a combustion appliance, a Combustion Appliance Safety Test shall be conducted by a certified Building Performance Institute (BPI) Analyst using the BPI Standard Testing Practices.¹¹ Deficiencies shall be reported to the owner or owner's representative in any failed tested system. The owner will be responsible to arrange for corrections any failed tested system and to install a carbon monoxide detector in 100% of dwelling units containing a combustion appliance in each building regardless of test results. If there are no combustion appliances in the dwelling units and it is determined that the testing is unnecessary, a statement confirming this fact will be included in the report.

Mandatory Duct Leakage Test

Duct leakage tests shall be conducted for all systems that have more than 12 feet of supply or return air ducts in unconditioned space. For purposes of the duct test requirements, ducts located in the space between two conditioned floors shall be considered to be within conditioned space. Ducted system leakage must be corrected per the Title 24 protocols and leakage targets for existing buildings, additions and alterations.

Mandatory Energy Efficiency

Achieve at least a 10% reduction in whole-building energy use as demonstrated by the Title 24 performance approach defined in the California Title 24 HERS II building energy efficiency standards. Measures claimed for performance compliance in the ACM software estimate of energy savings are based on demonstrated potential to achieve quantifiable electricity or gas (kWh, kW or therm) savings.

Identify opportunities to reduce energy used for space heating, space cooling, HVAC systems, domestic hot water systems, pumps, fans, appliances and lighting.

Additional Water and Green Building Measures

In addition to the mandatory measures described above, whole-house performance programs include other measures that require documentation during the audit process. Sample language is provided here describing the scope of these various measures.

On-site Energy Generation

Identify opportunities for onsite energy generation, including photovoltaic arrays, solar thermal collectors, small wind turbines, heat recovery and cogeneration systems.

Operations & Maintenance

Identify operations and maintenance opportunities with demonstrated potential to achieve quantifiable electricity or gas (kWh, kW or therm) savings.

This includes activities such as building commissioning, retro-commissioning, building automation systems, central water heating tune-ups and controls, operations and maintenance procedural changes, producing an operations and maintenance manual and related management training.¹²

Water Efficiency, Resource Conservation and Indoor Air Quality¹³

Identify opportunities for non-energy utility cost savings, including permanently installed water efficiency measures such as high efficiency toilets, landscaping and irrigation improvements, and recycling facility upgrades.

Identify opportunities for non-permanent resident upgrades such as low-flow showerheads and faucet aerators.

¹¹ www.bpi.org/contractor/standard.htm

¹² See BPI Building Operator Certification & NAHMA Green Building Operator Certification.

¹³ See GreenPoint Rated Existing Home Multifamily Program for non-energy measures & verification.

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Identify additional resource conservation and indoor air quality opportunities that might not have a financial payback but that will have a lower incremental cost if undertaken at the time of retrofit and that will provide comfort and environmental benefits to residents.

Analysis

Energy Modeling¹⁴

An energy model shall be completed using California Title 24 ACM-approved software to document the building's existing conditions and post-retrofit expected conditions. The model shall be based on building plans, initial inspection data and diagnostic data collected during the on-site visits. The energy model is used to estimate annual energy consumption and energy cost savings of potential energy conservation measures.

The procedures and regulations for modeling homes are established by the California Residential Energy Standards, ACM, HERS II Technical Manual and specific guidance from the software vendors.

- **Low-rise residential buildings:** The Title 24 ACM-approved software shall include CA HERS II calculations through one of the HERS Providers (currently CHEERS, CalCERTS and CBPCA).
- **High-rise residential buildings:** The software shall use a HERS II methodology as per the methods prescribed by the GreenPoint Rated Existing Home Multifamily module in the CA ACM-approved software EnergyPro.¹⁵

The Auditor must use any energy modeling software required by the project's local weatherization or other subsidy program (e.g., Treat or EA-Quip) in addition to Title 24 ACM-approved software.

Methods and Assumptions

All major assumptions used to develop the energy model and analysis must be clearly stated in the Audit Report. Reporting emphasis shall be placed on the assumptions that have the most impact on estimated energy savings.

Occasionally, some building features may be difficult to physically verify, such as the insulation in crawl spaces. When certain building features cannot be physically verified, the values from Table R3-50, Default Assumptions for Existing Buildings, in the 2008 Title 24 Alternative Calculation Method shall be used as the default conditions in the energy model and analysis.

Any savings accruing from air sealing measures shall not be applied unless it can be demonstrated that the infiltration reduction is between conditioned and unconditioned space.

Current operating schedules verified on-site are to be used for energy and energy cost savings estimates.

Ordering of Energy Efficiency Measures

The loading order of energy efficiency measures in the energy modeling analysis shall be structured so that improvements to the building envelope and interior lighting are modeled prior to improvements to the HVAC system.

¹⁴ See BPI 2.11 – BPI 2.17 Energy Analysis Process.

¹⁵ In the interim to HERS II software availability, T-24 ACM approved software runs demonstrating existing conditions and expected conditions shall be completed.

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The intent of this loading order requirement is to capture all of the potential effects of envelope and lighting energy efficiency measures on cooling and heating loads and subsequent investigation into impact of energy efficiency measures pertaining to HVAC equipment.

Utility Rates

The project shall be modeled using the current local utility rate schedules as verified during the review of the utility bills. The local utility rate may have to be created in the energy modeling software using the HERS II custom approach. Energy cost savings calculated outside of the modeling software shall be based on actual energy bills or average utility rates obtained from the Energy Information Agency.¹⁶

Model Calibration

The energy model for buildings that are master-metered shall be calibrated to actual utility billing data. Modeled baseline energy consumption shall be calibrated to monthly utility bills for a minimum of 12 months. The intent is to establish the modeling results verified for consistency and accuracy.

The energy model estimates of electricity and natural gas should calibrate to actual monthly consumption to within 10%. TMY 30 year average weather data can be used in lieu of actual year weather, which may be difficult to obtain.

Any adjustments made to the building description inputs used to calibrate the simulated building to actual energy usage shall be justified with explicit, transparent information and documented in this section of the Audit Report.

Exceptional Calculations

Energy conservation measures not directly modeled with the energy modeling software can be calculated outside of the software provided that generally accepted engineering calculations and methodologies are used. Interactive effects must be accounted for in exceptional calculations. The methodologies, assumptions and constants used in the exceptional calculations must be clearly documented in the final report. Sources of deemed savings must be referenced.

Sampling for Energy Analysis

If the project is comprised of multiple buildings, the whole building simulation shall include at least one example of each building type.

Utility Bill Analysis

Utility bill analysis can offer information on building energy efficiency and occupant behavior. Analysis must include base load evaluation, seasonal evaluation, and recommendations for energy usage reduction.

Acquire one or two years of utility bills and analyze use the patterns. Use the Project Information Form to input utility bill information and provide a summary report or assessment to the property owner that discusses baseline loads and recommendations for reduction of utility bills and improvement of comfort.

Financial/Payback Analysis

Provide financial analyses for a portfolio of measure that yields a positive net present value (NPV) in the format of the financial analysis table.

Prepare cash flow analyses that provide a calculated NPV and internal rate of return using the following default assumptions: 5% discount rate, 4% electricity rate escalator, and 3% natural gas cost escalator.

¹⁶ Average electricity and natural gas rates can be obtained from www.eia.doe.gov.

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Clearly state all assumptions including water rates, life of the measure, incremental costs, interactive effects, etc. Include as credits any applicable rebates, tax credits, grants and loans.

Benchmarking

Register the project in the U.S. EPA's Portfolio Manager tool. For multifamily properties, upload energy billing data as applicable and check with the Utility regarding the status of an Automated Benchmarking Service (ABS) that allows utility data to be directly uploaded.

Audit Report

For each facility, submit a sufficiently detailed yet succinct report that addresses the scope of the Audit. The Audit Report shall be presented to the client in a face-to-face meeting. The Audit Report shall include the following sections and content:

Section 1: Executive Summary

Summarize the major findings of the Audit, including:

- Basic building characteristics such as number of units, building construction type, number of stories, year built, total building area identified by use (residential, community/common, commercial), history of previous retrofits or rehabs, and other significant building features.
- Date of site visit.
- Names of individuals interviewed.
- Overall physical condition of the building (good, fair or poor with respect to structural integrity, maintenance and repair).
- Recommended energy efficiency and water conservation measures.
- Recommended green measures and other capital improvements needed to ensure the building's long-term integrity.
- Estimate of the cost to install each recommended measure (installation cost shall include prevailing wages).
- Projected savings from implementing each energy efficiency and water conservation measure both in dollars and kWh and therms.
- Comparison of total projected savings to existing energy use/cost.
- Savings to Investment Ratio¹⁷ of each measure.
- Projected carbon footprint reduction.

Section 2: Narrative

Include a written narrative that describes existing property conditions in the following categories:

- Site
- Building envelope including roof and windows, air flow, insulation and ducts
- Building mechanical and electrical systems, including (when applicable) heating, ventilation, cooling and electrical systems, and elevators
- Mechanical room, including (when applicable) boilers, domestic hot water systems, and plumbing systems
- Common areas including community rooms, kitchens, lobbies, corridors, and commercial spaces
- Dwelling units, as relates to: health and safety, energy efficiency and water conservation

Include information from the site visit to verify the building drawings. If the site conditions do not match design conditions, use the site conditions for analysis and reporting.¹⁸ Include information on equipment specifications in accordance with the Building Data Form.

¹⁷ Utility savings times estimated useful life divided by upfront cost of measure.

Section 3: Photo Documentation

Include photo documentation of the property, specifically targeted toward portraying the relevant physical conditions and energy efficiency and water conservation measures.

Section 4: Description of Energy Efficiency, Water Conservation, Green and Capital Improvement Recommendations

Provide information on each recommended measure and improvement, including but not limited to:

- Description of measures and recommended loading order
- Rationale for recommendation
- Estimated useful life of existing component
- Recommendation for timing of implementing the measure/replacement/improvement
- Identification of how cost estimate was derived (including source of cost information, unit pricing, take-off used)
- If renewable energy systems are not recommended, explain why not
- Non-energy related benefits of the recommended measures such as health and safety, improved indoor air quality, and increased resident comfort

Present this information as an Optimal Green Improvement Plan that includes the most cost-effective combination of recommended measures and improvements, factoring in loading order, available funding, estimated useful life of existing equipment/systems and property owner goals.

Include the results of the diagnostic testing conducted on-site and describe how the test results informed the rationale for the above recommendations. Auditors may also offer recommendations for the retro-commissioning of certain existing equipment based on diagnostic test results.

Also include a summary of the combustion analysis testing completed during the energy audit. For all audited dwelling units, include the results of combustion safety testing and identify if action was warranted as a result. Report recommendations shall include carbon monoxide detectors if they are not already installed in dwelling units.

Section 5: Energy and Water Audit and Analysis

a. Energy and Water Analysis Methodology

Summarize the modeling approach and other calculation methods used in the energy and water analysis. Include the name and version of the energy modeling software used and indicate if exceptional calculations were used to estimate energy and energy cost savings. Provide a summary of the approach, and detailed calculations, used in any exceptional calculations used for analysis.

b. Utility Analysis and End Use Breakdown

Describe the applicable end uses for each type of fuel at the project and show a breakdown of the annual energy usage and energy cost by fuel type. The Auditor shall:

- Graph energy usage for each fuel type for a minimum of 12 months.¹⁹
- Review the utility rate structure to determine if it seems appropriate for the project.²⁰
- Make a recommendation for further investigation if the Auditor finds that the rate structure does not match the utility data.

c. Source of Information

Briefly describe all sources of information used to inform the analysis including:

¹⁸ BPI Standard 3.3 Blueprint Evaluation/Site Visit.

¹⁹ BPI 2.8.

²⁰ BPI 2.10; 5.6.

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- Source and scope of utility billing data supplied to the Auditor including the data source, the duration in months that the data covers, and whether the Auditor received copies of the actual utility bills or electronic interval data.
- Construction cost information used in economic analysis.
- Whether building plans or site verified data were used in the analysis.
- Any discrepancies between plans and verified conditions.
- Utility rate and schedules.
- Source of deemed energy savings.

d. Energy Model Inputs and Assumptions

State any assumptions used when analyzing energy and water utility data.²¹ Reference the Building Data Form as well as the building simulation program input file.

e. Energy Model Documentation

Provide final energy model input and output files used to report energy and energy cost. A log of all final justified adjustments made to the energy model during the calibration process shall also be submitted in the Audit Report.

Section 6: Energy Efficiency and Water Conservation Cost/Benefit Analyses

Include the individual cost/benefit worksheets for each recommended energy efficiency and water conservation measure. The worksheets shall show implementation cost, energy and water consumption and financial savings, simple payback, and incremental payback (as applicable).

Section 7: Qualifications and Certifications

Include a description of the qualifications and professional certification of any person who worked on the Audit.

Section 8: Representation

Include a representation from an officer or owner of the firm conducting the Audit that the Audit meets the *[Program Name]* Audit Specifications without exception and that the final Audit Report has been reviewed for quality assurance purposes by a principal or officer of the firm.

Data & Reporting Forms

See attached excel file:

- Project Information Form
- Building Data Form
- Diagnostic Testing Reference Form

²¹ BPI 2.14.