



ASHRAE 100-2018: Section 8 and ASHRAE Energy Audit Standards

"Well, How Do We Get Here?..."

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What We'll Cover This Hour

An Overview of Section 8, with a small dive into scope, definitions and methods for required energy audits:

- Disclosures
- Assumptions
- Section 8 Condensed Directives:
 - How We Get to Energy Auditing
 - Exceptions
 - General Energy Audit Scope and Definitions
 - The Common Case: Audit Req'ts for Buildings with Stat EUI_t
 - The Tough Case: Audit Req'ts for Buildings w/o State EUI_t
 - Standard 100–2018 Energy Audit Reporting Requirements
- A Look at Level 2 Audits Under AHSRAE Standard 21–2018
 - Some Preliminaries
 - Scope of Building Systems Addressed
 - Energy Auditor Roles
 - Tasks Expected Completed in Advance
 - The Audit Process in Bullets
 - Forms and Data Tools

Disclosures....

Notes: The presenters have developed this presentation from what they consider to be the most relevant and significant language in ASHRAE Standards and Annexes being used as the basis for this rulemaking. The sources are widely copied verbatim in the following presentation in the interest of clarity and neutrality; quotations are not explicitly demarked. All credit for these copied materials are to the ASHRAE authors. All such text and graphics are courtesy of ASHRAE and none should be copied without permission.

*The presenters have excluded some language for brevity and reordered the ASHRAE subsections for clarity in some cases. Notations and focus points have been added, typically **highlighted**. The audience may find important points missing. Any such exclusions are the presenter's sole responsibility; please point out any gaps you see.*

*Also, where language from the RCW is quoted or ASHRAE Standards language are proposed for consideration to be changed or added by the Dept. of Commerce in the WAC, it is **highlighted as shown here**.*

RCW 19.27a.210

(2) (d)(i) Must adopt a conditional compliance method that ensures that covered commercial buildings that do not meet the specified energy use intensity targets are taking action to achieve reduction in energy use, including investment criteria for conditional compliance that ensure that energy efficiency measures identified by energy audits are implemented to achieve a covered commercial building's energy use intensity target.

The investment criteria must require that a building owner adopt an implementation plan to meet the energy intensity target or implement an optimized bundle of energy efficiency measures that provides maximum energy savings without resulting in a savings-to-investment ratio of less than 1.0, except as exempted in (d)(ii) of this subsection.

The implementation plan must be based on an **investment grade energy audit*** and a life-cycle cost analysis that accounts for the period during which a bundle of measures will provide savings. The building owner's cost for implementing energy efficiency measures must reflect net cost, excluding any costs covered by utility or government grants.

The implementation plan may exclude measures that do not pay for themselves over the useful life of the measure and measures excluded under (d)(ii) of this subsection. The implementation plan may include phased implementation such that the building owner is not required to replace a system or equipment before the end of the system or equipment's useful life.

The presentation following assumes:

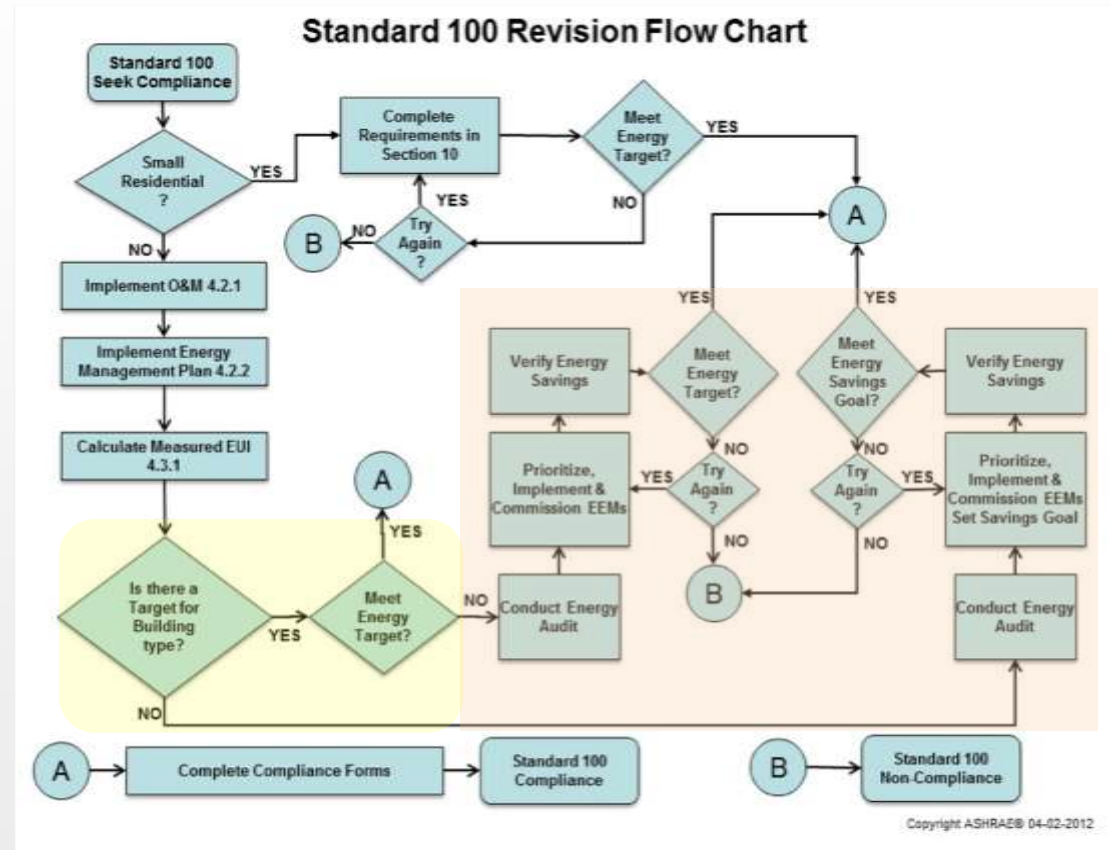
1. That the building under consideration for auditing is subject to RCW 19.27a.210, and its WACs as ultimately made into code.
2. The building has already either:
 - Submitted a calculated EUI (and not met its State EUI_t)
~ OR ~
 - Was not able to be classified into any group of building types and so does not have State EUI_t

Energy Auditing: ...Well, How Do we Get Here?

8.2 An energy audit shall be conducted for all buildings not having an *Energy Target*.

- The energy audit and the associated energy audit report shall be completed by a qualified energy auditor practicing within their field of competency.
- The energy audit shall be a Level 2 audit (as defined in Section 8.4.2)

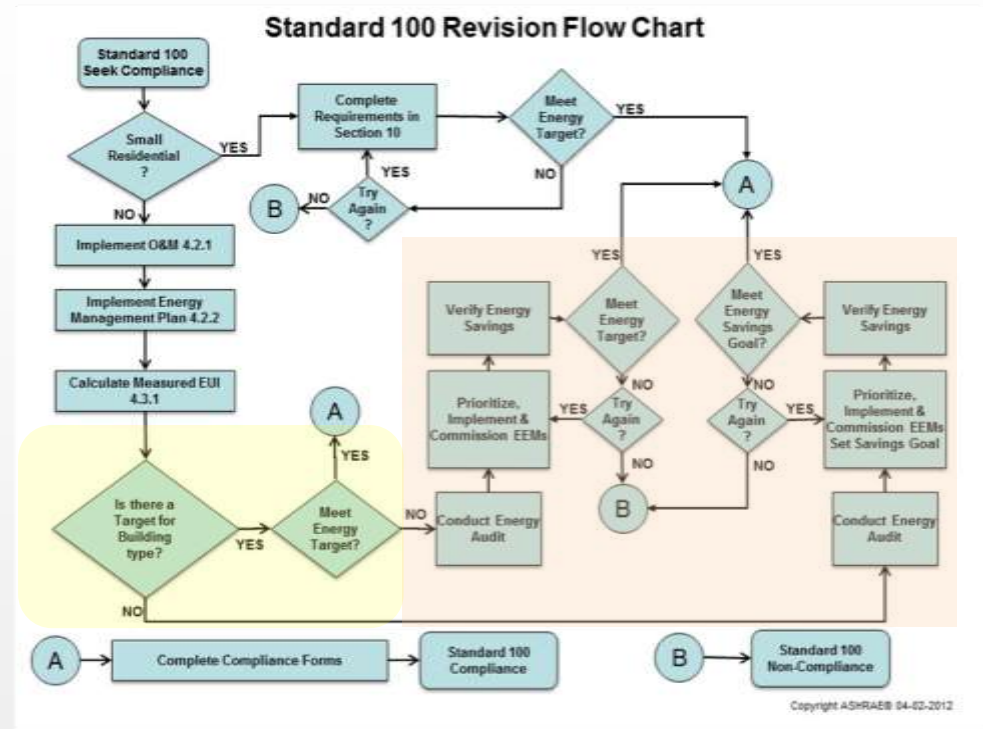
OR...(Much More Likely)...



Energy Auditing: ...How We Get Here

8.3 Energy Audit Requirements for Buildings with an Energy Target

- An energy audit shall be conducted, and an associated energy audit report shall be provided, for all *buildings* that do not meet their *energy target*.
- The energy audit shall be at an audit level specified by the qualified energy auditor to be sufficient to identify and evaluate the EEMs that, if implemented, would result in the building meeting its energy target.



Notably, this case does not require a Level 2 Audit; for example, a so-called *Targeted Audit* might identify sufficient Energy Efficiency Measures (EEMs) for the building to meet its State EUI_t

Energy Auditing: ...Exceptions

Exception to 8.2.1 [Buildings without an EUI_t]: Buildings that have completed an energy audit within the previous three years may use the results of the previous audit, provided that the scope of the energy audit meets the requirements of this section and that there have been minimal changes to the systems within the audit scope. The energy audit must be evaluated using the economic evaluation criteria in section 9.XXX.



Here is an example of a proposed language change

Exception to 8.3.2 [Buildings that have not met their EUI_t]: Buildings that have completed an energy audit within the previous three years may use the previous energy audit to identify EEMs for implementation, provided that the scope of the energy audit meets the requirements of this section and there have been minimal changes to the systems within the audit scope. In this case, the same comparison of adjusted EUI to energy target shall be made by the applicant. If the EEMs identified in the audit are still applicable, have not been implemented, and if implemented would result in the building meeting its energy target, these measures shall be implemented by the facility, and the project shall follow the procedures in Section 9. If the identified EEMs do not result in an adjusted EUI less than the energy target, a new energy audit shall be conducted as described Section 8.3.2.

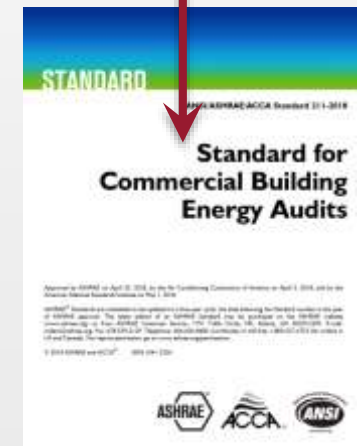
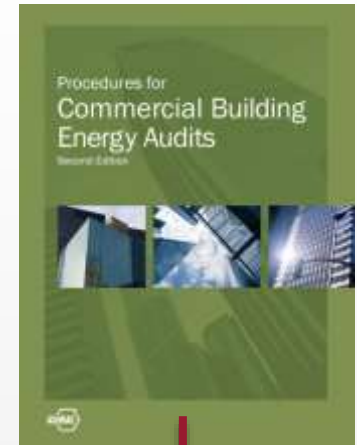
General Energy Audit Scope and Definitions

...So, the compliance paths diverge somewhat for those buildings that don't achieve the State EUI_t , versus those buildings that somehow cannot be included in an existing State EUI_t class. ***But generally:***

8.4 Energy Audit Level **For RCW 19.27a.210 Compliance**

- Buildings [50,000 sf or more, as required in law] shall perform an energy Audit [typically at Level 2 – energy survey and engineering analysis] as defined in ASHRAE's Procedures for Commercial Building Energy Audits, 2nd Edition.

[Presenter's Note – per ASHRAE: “The precise definitions of ASHRAE Energy Audit Levels 1, 2 and 3 in Procedures for Commercial Building Energy Audits, 2nd Edition, have been superseded by ANSI/ASHRAE/ ACCA Standard 211–2018 Standard for Commercial Building Energy Audits”]



General Energy Audit Scope and Definitions

Qualified Energy Auditor: a person having training and expertise in building energy auditing; any one of the following:

- a. A licensed professional architect or engineer in the jurisdiction where the project is located
- b. An energy auditor/assessor/analyst certified by ASHRAE or AEE for all building types
- c. A person qualified by the authority having jurisdiction (AHJ): the agency or agent responsible for enforcing this standard. ([Washington State Department of Commerce](#))

Qualified Person: a person having training and expertise in building energy–use analysis; any of the following:

- a. A licensed professional architect or engineer, or licensed contractor in the jurisdiction where the project is located
- b. A certified energy auditor or manager
- c. A person qualified by the AHJ ([Washington State Department of Commerce](#))

The Common Case – ‘8.3’: Energy Audit Requirements for Buildings with Energy Targets

8.3 Energy Audit Requirements for Buildings with Energy Targets – Overall Process:

1. The energy audit shall be completed by a qualified energy auditor practicing within their field of competency.
2. The energy audit shall be at an audit level (typically Level 2), specified by the qualified energy auditor to be sufficient to identify and evaluate the EEMs that, if implemented, would result in the building meeting its energy target.
3. After the completion of the audit and the selection of EEMs to be implemented, the applicant must calculate an adjusted energy-use intensity (EUI) for the building based on the estimated energy savings from the selected EEMs and the historical energy use of the building.
4. This adjusted EUI is then compared to the energy target for the building. If the adjusted EUI is less than the energy target, the applicant shall proceed with implementation (see Section 9).
5. If the adjusted EUI is greater than the energy target, a more rigorous energy audit investigation is required to identify additional EEMs.
6. This process is repeated until the building's adjusted EUI is less than its energy target.

The Common Case – ‘8.3’: Energy Audit Requirements for Buildings with Energy Targets

8.3 Energy Audit Requirements for Buildings with Energy Targets – Follow on Objective:

- Following the completion of an energy audit that has identified EEMs sufficient to meet the building's energy target, the applicant shall implement those EEMs per the requirements of Section 9.
- **Exception to 8.3.2 [Buildings that have not met their EUI_t]:** Buildings that have completed an energy audit within the previous three years may use the previous energy audit to identify EEMs for implementation, provided that the scope of the energy audit meets the requirements of this section and there have been minimal changes to the systems within the audit scope. In this case, the same comparison of adjusted EUI to energy target shall be made by the applicant. If the EEMs identified in the [preexisting] audit are still applicable, have not been implemented, and if implemented would result in the building meeting its energy target, these measures shall be implemented by the facility, and the project shall follow the procedures in Section 9. *If the identified EEMs do not result in an adjusted EUI less than the energy target, a new energy audit shall be conducted as described Section 8.3.2.*

The Tough Case – ‘8.2’: Energy Audit Requirements for Buildings without Energy Targets

8.2 Energy Audit Requirements for Buildings without Energy Targets – Overall Process:

1. The energy audit and the associated energy audit report shall be completed by a qualified energy auditor practicing within their field of competency.
2. The scope of the energy audit shall include the following required end uses as applicable to the building (a comprehensive commercial building systems audit):
 - Envelope
 - Lighting
 - Cooling
 - Heating
 - Ventilation and exhaust systems
 - Air distribution systems
 - Heating, chilled, condenser, and domestic water systems
 - Refrigeration except for food processing refrigeration
 - Power generation equipment
 - Uninterruptible power supplies and power distribution units
 - People-moving systems

The Tough Case – ‘8.2’: Energy Audit Requirements for Buildings without Energy Targets

2. End Use Scope of the energy audit, Continued:

- These end use types are *not included*:
 - Industrial processes
 - Agricultural processes
 - Irrigation

8.2 Energy Audit Requirements for Buildings w/o Energy Targets – Follow on Objective:

- Following the completion of the energy audit, the building owner will select and implement EEMs per the requirements of Section 9.

Energy Audit Reporting – 1

8.5 Energy Audit Report Scope and Process Direction:

- The energy audit report shall define the actions necessary for the building owner to achieve the energy and cost savings that are recommended in the report.
- Energy audit results shall be presented in a summary table that includes, at a minimum, an estimate of each of the following:
 - A list of recommended EEMs that, if implemented, will either meet the energy target for the building if it has a target or, if it does not have an energy target, will meet the economic criteria set by the standard in Section 9.
 - The estimated *energy savings and peak demand savings* associated with each recommended EEM, expressed in the cost units used on the building owner's energy bills, and the units used for comparison with the energy target.
 - The estimated (modeled) energy cost savings associated with each recommended EEM.

Energy Audit Reporting – 2

8.5 Energy Audit Report Scope and Process Direction, continued...

- ...Audit report summary table, Cont'd:
 - The estimated cost of implementation for each recommended EEM. The costs of implementation shall include the required monitoring of energy savings per the requirements of Section 9.
 - **The Savings to Investment Ratio (SIR)** for each recommended EEM and the bundle of EEMs.
 - **The savings to investment ratio** of the *optimized bundle* of EEMs that will achieve the energy target for buildings with energy targets or meet the financial criteria set out in the standard for buildings that do not have energy targets.

Per ASHRAE 100–2018 Standard definition, an “optimized bundle of EEMs” is: A collection of EEMs that maximizes the energy savings at a facility within the cost effectiveness criteria of the standard. It excludes any measure with a **SIR** that exceeds the life of the measure. A bundle of measures is optimized by including the maximum number of EEMs within the bundle while still meeting the cost effectiveness criteria. The process for determining the optimized bundle may be an iterative one due to interactive effects of individual EEMs.

Energy Audit Reporting – 3

8.5 Energy Audit Report Scope and Process Direction, continued...

- When considering multiple EEMs with interactive effects, per best practice, the order of analysis shall be:
 - Start with load reduction measures;
 - Follow with distribution systems and associated equipment efficiencies;
 - Plant and heat-rejection systems.
- Any interactive effects on equipment sizing and part load performance of equipment shall be accounted for due to reduced loads on subsequent systems
- The Report energy savings analysis shall include interactive effects of all selected EEMs.
 - Example: When a lighting project is implemented, the heating loads go up and cooling loads go down.
- The EEMs recommended in the energy audit report shall consist of an optimized bundle of EEMs

Energy Audit Reporting – 4

8.5 Energy Audit Report Scope and Process Direction, continued...

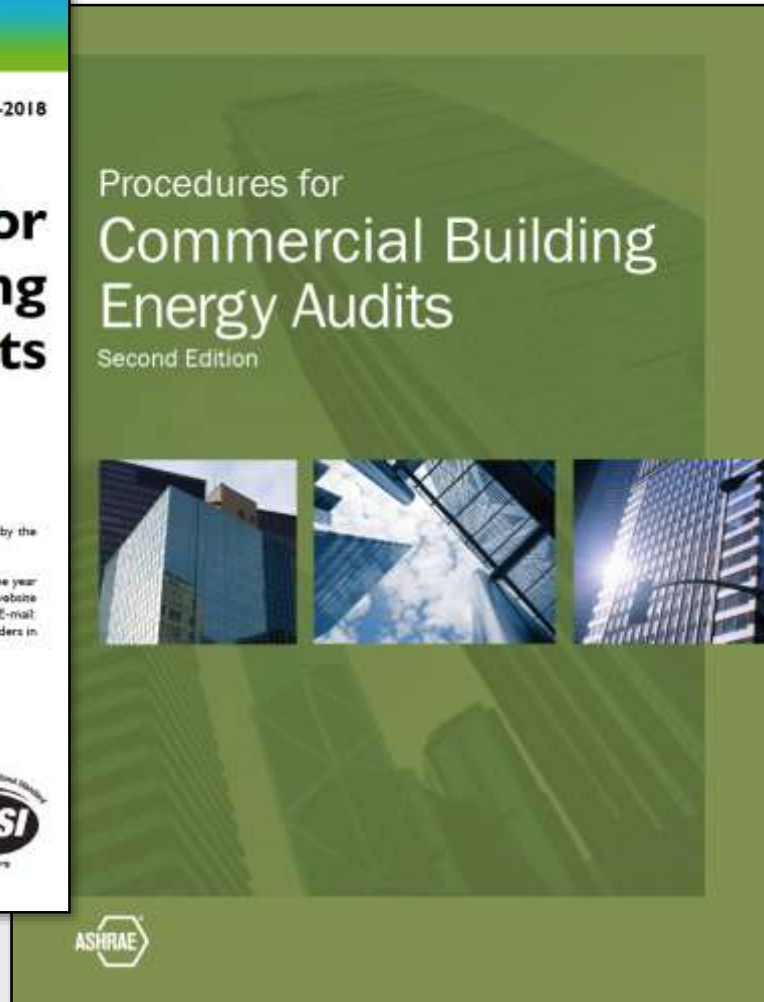
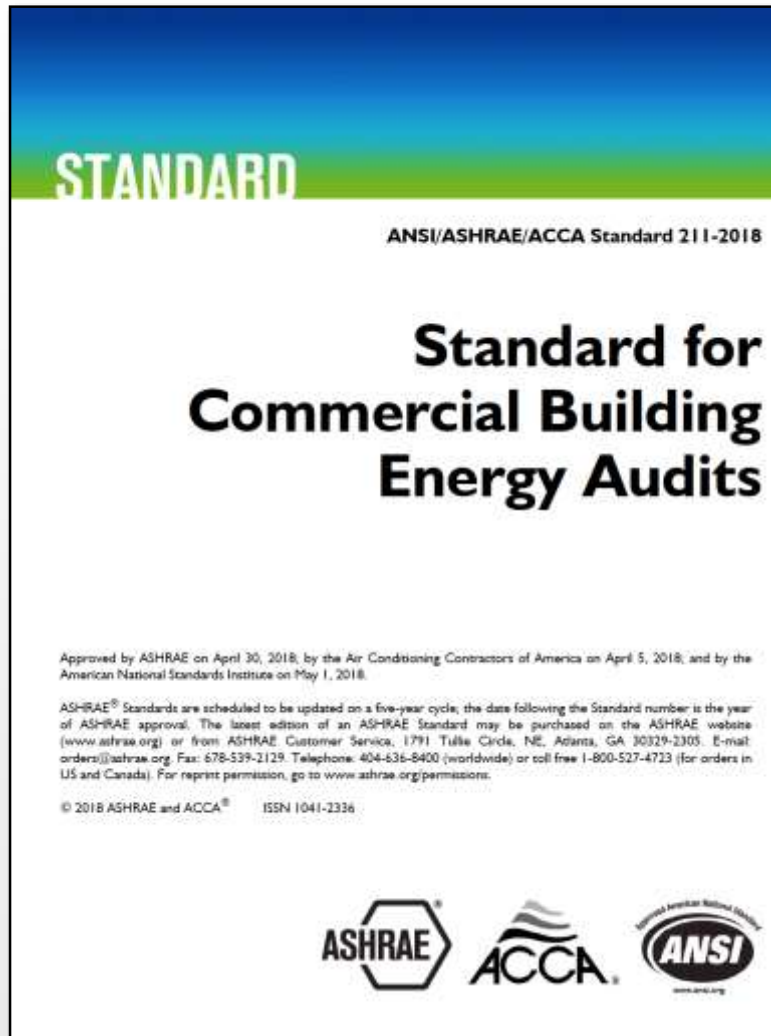
- Financial analysis shall be made using current utility rate charges for the site.
- For customers who are charged based on time-of-use or peak demand (kW), cost analysis of those EEMs shall include appropriate treatment of the costs savings associated with the measures and reflect peak demand or time-of-use cost savings.
- For Nonfederal Facilities, the minimum financial criteria required for reporting include the following:
 - a. EEM implementation cost
 - b. Energy cost savings based on current utility rates
 - c. Maintenance and operation cost savings (or penalties)
 - d. EEM savings to investment ratio*
 - e. EEM measure life
- U.S. Federal Facilities, shall follow the National Institute of Standards and Technology (NIST) Building Life-Cycle Cost (BLCC) Program.

Energy Audit Reporting – 5

8.5 Energy Audit Report Scope and Process Direction, continued...

- The energy audit shall include an *end-use analysis* that compares the estimated energy use of the facility after implementation of all selected EEMs to historical utility consumption.
 - The energy auditor is required to estimate the energy use of all end uses that individually comprise more than 5% of total historical building energy use.
 - The energy estimates for these end uses shall be summed and compared to historical energy consumption for the facility. The sum of the base-case end-use energy estimates must be between 90% and 100% of the historical energy use at the site.
 - This comparison shall be conducted separately for each fuel type, such as electricity, natural gas, or fuel oil, for which EEMs are identified.
 - On-site energy sources such as solar, photovoltaic, geothermal, and wind shall be included.
 - Correction for historical weather for the base year versus average weather used in baseline estimates **should** be used.

A Look At ASHRAE's Energy Audit Standard



Some Preliminaries

2.1 SCOPE: This [211–2018] standard applies to all buildings except single-family houses, multifamily structures of three stories or fewer above grade, manufactured houses (mobile homes), and manufactured houses (modular).

3.1 Definitions [Salient and/or new to audience]: qualified energy auditor: an energy solutions professional who assesses building systems and site conditions; analyzes and evaluates equipment and energy use; and recommends strategies to optimize building resource use. Experience must include completion of five commercial (nonresidential) building energy audits within the past three years or a cumulative completion of ten or more commercial building energy audits. The auditor must be one of the following:

- a. A person who holds a certification from a credentialing program approved by the U.S. Department of Energy Better Buildings Workforce Guidelines for Building Energy Auditors or Energy Managers.
- b. A licensed professional engineer or a licensed contractor specifically approved by the AHJ to conduct energy audits
- c. A person approved as qualified by the authority having jurisdiction (AHJ)

More Preliminaries

Targeted Audits (from *Procedures for Commercial Building Energy Audits Second Edition*): A targeted audit is an investigation with a limited scope, typically a single energy-using system, central plant, or area of the building.

A targeted audit will identify and provide savings and cost analyses for retrofits and control strategy improvements for the systems of interest. The level of effort may be tailored to the needs of the facility. Because the audit is limited to a portion of the building, whole-building approaches such as end-use allocation and comparisons with historical utility bills cannot be used to provide a check on analytical methods.

4.1 Compliance with the [211-2018] standard shall be certified by a qualified energy auditor using the compliance form in Normative Annex A. By signing and certifying the compliance form, the qualified energy auditor attests that the energy audit conforms to the methods and procedures of this standard and that the work was reviewed or completed, as required, by a qualified energy auditor.

Scope of Building Systems – Worth Repeating

5.1 Scope of Building Systems Included: The scope of the energy audit shall include the following systems, as applicable to the building:

- a. Envelope (including infiltration, exfiltration, and stack effect pathways)
- b. Lighting (interior and exterior)
- c. HVAC (cooling, heating, air distribution, ventilation and exhaust systems [including those to meet loads due to laundry and mail chutes])
- d. Building automation systems (BASs)
- e. Heating, chilled, condenser, and domestic water systems and associated pumps
- f. Steam systems
- g. Refrigeration (except for food processing refrigeration)
- h. Onsite power generation equipment, including renewable energy systems
- i. Uninterruptible power supplies, power distribution units, and critical power systems
- j. Data centers and information technology infrastructure
- k. Conveyance systems (escalators, elevators, baggage handling, moving sidewalks, and similar)
- l. Plug loads (including office equipment, personal computers, appliances)
- m. Laundries
- n. Food preparation
- o. Pools, saunas, and spas

The following end uses are not included in this standard:

- a. Industrial processes
- b. Agricultural processes
- c. Irrigation

Energy Auditor Roles

Role of the Qualified Energy Auditor. The following activities must be completed by the qualified energy auditor to achieve compliance:

- a. Conduct a site visit.
- b. Identify and qualify EEMs.
- c. Conduct quality assurance for Levels
- d. Present results to building owner
- e. Sign the compliance form

The qualified energy auditor shall conduct or supervise the completion of all other required tasks as described in this standard...

Tasks Expected Completed in Advance

- **5.2.3 Preliminary Energy Use Analysis (Benchmarking).** Benchmark the building's normalized energy consumption relative to that of similar (peer) buildings using energy consumption data spanning a minimum of 12 consecutive months and up to three consecutive years, as available.
- **5.2.3.2 Calculate the Energy Cost Index.** Calculate total annual building energy cost, including all taxes, and divide by gross floor area to obtain the Energy Cost Index (ECI). The method used to determine total annual building energy cost and any relevant normalizing parameters shall be described in a transparent manner and included with any PEA reporting requirements for ECI.
- **5.2.3.3 Compare EUI to a Peer Sample.** The EUI for the building shall be benchmarked [using the approved WS State methods, as compared to an EUI_t](#).
- **5.3.1 Review Historical Utility and Onsite Generation Data.** Prior to the site visit, review monthly and annual utility data. The data shall include a minimum of 12 consecutive months (up to three consecutive years shall be used as available), aggregated for the whole building in accordance with ASHRAE Standard 105, Section 5.3.
- **5.3.2 Review Rate Structure:** For each metered energy source, identify utility rate/tariff schedule elements, such as the following:

The Audit Process in Bullets

.... Level 2 "stacks" activities on Level 1:

- **Level 1 Audit:**

- 5.3.3 Facility Site Survey
- 5.3.4 Space Function Analysis
- 5.3.5 Identify Low-Cost and No-Cost Energy Efficiency Measure (EEM) Recommendations
- 5.3.6 Identify Potential EEM Capital Recommendations
- 5.3.7 Review EEMs with Owner's Representative

- **Level 2 Audit (added activities):**

- 5.4.1 Energy Cost Component Breakdown
- 5.4.2 Facility Site Survey (Level 2)
This survey adds further detail to the Level 1 survey. Shall include the systems present in the facility and listed within the scope of Section 5.1.1. The forms in Normative Annex C shall be used to report these characteristics. These forms shall be completed per the facility description reporting requirements of Section 6.2.1
- 5.4.3 Review of Current O&M Procedures

The Audit Process in Bullets, Continued

- **Level 2 Audit, Continued:**

- **5.4.4 Determine Key Operating Parameters**

The existing operating parameters for energy using systems shall be determined in terms of the following. **Energy using systems shall include equipment that collectively makes up greater than 80% of the energy use of the building.**

- 5.4.5 Conduct End–Use Breakdown

- 5.4.6 **[Develop]** Initial Measures List

- 5.4.7 Calculate Energy Savings

- 5.4.8 Estimate EEM Costs

- **5.4.10 Quality Assurance Review**

A quality assurance review shall be conducted to evaluate the feasibility and appropriateness of identified measures, as well as the reasonableness of energy savings projections, implementation cost estimates, and all observations and findings of the energy audit.

- **5.4.11 Review EEMs with Owner's Representative**

Representative Audit Report Outlines

See page 26 of
Std. 211-2018:

(This annex is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

INFORMATIVE ANNEX D REPORT OUTLINES

Level 1 Report Outline

1. EXECUTIVE SUMMARY
 - a. Overall assessment of benchmarking and energy performance
 - b. Potential savings and return on investment (ROI)
 - c. Table of recommended measures with estimated level of savings and ROI
2. INTRODUCTION
 - a. Audit scope
 - b. Key dates
 - c. Contact information
3. FACILITY DESCRIPTION
 - a. Site information
 - b. Notable conditions
4. HISTORICAL UTILITY DATA
 - a. Data summary and rate schedules
 - b. Annual Energy Use Intensity (EUI), Energy Cost Index (ECI)
5. BENCHMARKING
6. ESTABLISH TARGET AND ESTIMATE SAVINGS
7. ENERGY SAVING OPPORTUNITIES
 - a. Low-cost/no-cost savings measures
 - b. Capital projects

APPENDICES

- Tabulated utility data (Annex C tables)
- Utility rate schedules (Annex C tables)
- Basis for savings and cost estimates
- Lighting and equipment inventory tables (optional)

Level 2 Report Outline

1. EXECUTIVE SUMMARY
 - a. Overall assessment of benchmarking and energy performance
 - b. Aggregated savings and costs of recommended measures
 - c. Table of recommended measures with savings and costs
2. INTRODUCTION
 - a. Audit scope
 - b. Key dates
 - c. Contact information
3. FACILITY DESCRIPTION
 - a. Building information
 - b. Building envelope
 - c. Heating, ventilating, and air conditioning (HVAC)
 - d. Service hot water (SHW)/domestic hot water (DHW)
 - e. Lighting
 - f. Process and plug loads
4. HISTORICAL UTILITY DATA
 - a. Data summary
 - b. Utility rate structures
 - c. Benchmarking
 - d. Target and savings estimate
 - e. End-use breakdown
5. ENERGY SAVING OPPORTUNITIES
 - a. Low-cost/no-cost savings measures
 - b. Capital projects
 - c. Distributed/renewable energy opportunity
 - d. Energy efficiency measures (EEMs) considered but not recommended
6. EEM COST ESTIMATES
7. EEM ECONOMIC ANALYSIS
8. QUALITY ASSURANCE

APPENDICES

- Tabulated utility data (Annex C tables)
- Utility rate schedules (Annex C tables)
- Calculation methodology
- Savings calculations
- Cost estimates
- Lighting and equipment inventory tables
- Operations and maintenance (O&M) logs
- Equipment specifications

Some Forms and Tools To Note

Note: Forms to be submitted for compliance with RCW 19.27a.210 are still under review and/or development – The ASHRAE forms shown are only offered for reference and consideration

(This is a normative annex and is part of the standard.)

NORMATIVE ANNEX A COMPLIANCE FORM

Form A—Compliance with Standard 211					
Name of Facility					
Street Address					
City		State		Zip Code	
Building Owner or Representative, Title, Affiliation:					
Name of qualified energy auditor:					
Street Address					
City		State		Zip Code	
Telephone No.					
Qualifying Certification:					
Has the Preliminary Energy Use Analysis been completed? ☐ Yes ☐ No					
Have the requirements of Section 5 been met? ☐ Yes ☐ No					
Have the requirements of Section 6 been met? ☐ Yes ☐ No					
Date the Level 1 Audit was completed.					
Date the Level 2 Audit was completed.					
Date the Level 3 Audit was completed.					
I state that the attached Energy Audit Report complies with ANSI/ASHRAE Standard 211:					
Signature of qualified energy auditor:		Date: _____			
Signature of Authority Having Jurisdiction:		Date: _____			
Compliance		Date: _____			

Form E—Final Use Analysis Requirements Level 2		
Compliance Form—Standard 180		
Section 5, "Energy Audit Requirements"		
Final Use Analysis Requirements—Level 2		
Complete the following tables OR attach a report summarizing same (such as DOE-2 B2PFS). Add additional sheets as necessary for other final sources.		
Electric End Use (List base-case energy-use estimates of all end uses that comprise >2% of annual site use.)		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual electricity consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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10.		
Total		
Historical annual fuel/other consumption (kWh) Compute % of historical		
End-Use Description	Base-Case Consumption Estimate, kWh	% of Total
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Some Forms and Tools To Note:

– ASHRAE Excel Data Form

...A Useful Excel-Based data gathering and structuring tool is referenced and available w/ Std. 211-2018 (ref pp. 25):

NORMATIVE ANNEX C REPORTING FORMS

The forms located at <http://www.ashrae.org/211-2018> are mandatory reporting requirements for Level 1 and Level 2 energy audits. The qualified energy auditor shall provide these as part of any compliant energy audit. The forms report basic building characteristics, energy use, and recommended energy efficiency measures in a standardized format. **To comply with the standard, reports must use the data and the format shown on these forms. Alternatively, the qualified energy auditor may report information on these forms via direct electronic data.**

submission through a standard electronic format approved by the authority having jurisdiction, provided that the electronic format includes all of the data in these forms at the same level of accuracy and completeness. The template is provided in Excel for convenience but can be in any file format.

The Level 2 forms, along with the additional information specified in worksheet “Asset Score Inputs,” provide the minimum data required to determine a Building Energy Asset Score using the DOE’s online Energy Asset Score tool. However, inclusion of the asset score value itself is not required for compliance with the standard. Fields that are required to obtain an asset score evaluation are marked with an asterisk (*).

ASHRAE Excel Data Forms – Examples

All Audit Levels - Building Characteristics

Building Name* user input

Building Owner calculated

Energy Auditor

Street*

City*

State*

Postal Code*

Date of site visit(s)

Primary Building use type*

Client Name

Key Contacts

Gross floor area* sq m

Total Number of Floors

Total conditioned area (both heated and cooled) sq m

Conditioned area (heated only) sq m

Level 2 Audit - End Use Breakdown

This table is used to:

- 1) compile end use energy estimates and;
- 2) verify that base case energy use estimates align with historical energy use.

NOTE - End use breakdown values should reflect building operation under long term weather normalized conditions, and thus may differ from historical energy use when there is a difference between long term weather data and the period in which the historical energy use is referenced.

Utility #1	Electricity
Units	kWh
MWh/yr	8.6

All Audit Levels - Metered Energy

Guidance on the terms "Main Data for Analysis" and "Supporting Annual Use Data"

Main Data for Analysis - Filling in these tables is mandatory, and the data in these tables will be referenced throughout the rest of the forms, such as the End Use Breakdown, Annual Summary, and GAGG.

Supporting Annual Use Data - Filling in these tables is only required if the auditor is using more than 12 months of consecutive data. This supporting data from historical energy use can be used to inform the Main Data for Analysis.

If sampling of meters was performed during utility analysis, describe methodology here:

Utility #1: Electricity

Start Date	End Date	Days	Electricity Use (kWh)	Electricity Peak (kW)	Electricity Cost (\$)	Electricity Load Factor
1/1/10	2/1/10	31				#DIV/0!
2/1/10	3/1/10	28				#DIV/0!
3/1/10	4/1/10	31				#DIV/0!
4/1/10	5/1/10	30				#DIV/0!
5/1/10	6/1/10	31				#DIV/0!
6/1/10	7/1/10	30				#DIV/0!
7/1/10	8/1/10	31				#DIV/0!
8/1/10	9/1/10	31				#DIV/0!
9/1/10	10/1/10	30				#DIV/0!
10/1/10	11/1/10	31				#DIV/0!
11/1/10	12/1/10	30				#DIV/0!
12/1/10	1/1/11	31				#DIV/0!
Annual Total:		365				

Utility #1: Electricity

Start Date	End Date	Days	Electricity Use (kWh)	Electricity Peak (kW)	Electricity Cost (\$)	Electricity Load Factor
1/1/10	2/1/10	31				#DIV/0!
2/1/10	3/1/10	28				#DIV/0!
3/1/10	4/1/10	31				#DIV/0!
4/1/10	5/1/10	30				#DIV/0!
5/1/10	6/1/10	31				#DIV/0!
6/1/10	7/1/10	30				#DIV/0!
7/1/10	8/1/10	31				#DIV/0!
8/1/10	9/1/10	31				#DIV/0!
9/1/10	10/1/10	30				#DIV/0!
10/1/10	11/1/10	31				#DIV/0!
11/1/10	12/1/10	30				#DIV/0!
12/1/10	1/1/11	31				#DIV/0!
Annual Total:		365				

Utility #2: Natural Gas

Start Date	End Date	Days	Natural Gas Use (therms)	Natural Gas Cost (\$)
1/1/10	2/1/10	31		
2/1/10	3/1/10	28		
3/1/10	4/1/10	31		
4/1/10	5/1/10	30		
5/1/10	6/1/10	31		
6/1/10	7/1/10	30		
7/1/10	8/1/10	31		
8/1/10	9/1/10	31		
9/1/10	10/1/10	30		
10/1/10	11/1/10	31		
11/1/10	12/1/10	30		
12/1/10	1/1/11	31		
Annual Total:		365		

End Use Summary

End Use	Total MJ	% of Total MJ
Heating	0	#DIV/0!
Cooling	0	#DIV/0!
Distribution (fans)	0	#DIV/0!
W/DHW	0	#DIV/0!
Refrigeration	0	#DIV/0!
Lighting	0	#DIV/0!
Plug Loads	0	#DIV/0!
Process Loads	0	#DIV/0!
Ventilation	0	#DIV/0!
Miscellaneous	0	#DIV/0!
Information Technology	0	#DIV/0!
Other	0	#DIV/0!
Total	0	#DIV/0!
Adjustment for On-Site Generation	#VALUE!	
Adjusted Total w/ Generation	#VALUE!	
Difference	#VALUE!	

* Enter name and units for Energy type E. Use terms from ASHRAE Standard 120 as appropriate (listed below).

* Insert additional columns if there are more than 3 energy types and modify summary table as needed.

* If cogeneration or CHP systems supply the building and are outside this building boundary, then the energy supplied will be hot water, steam, chilled water, and/or electricity that are accounted for as Energy Type E in this table. If that system is inside the building boundary, then the energy supplied will be natural gas that is entered into this table.

Thanks for your attention and participation!



Energy Program
WASHINGTON STATE UNIVERSITY