



BSR/BPI-1100-T-202x

HOME ENERGY AUDITING STANDARD



Notice

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This standard does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

This standard was formulated under the cognizance of the BPI Standards Technical Committee.

Introduction (Informative)

The Building Performance Institute, Inc. (BPI) publishes standards related to the energy efficiency and performance of residential buildings. This *Home Energy Auditing Standard* is the basis for BPI's Energy Auditor Certification and provides requirements for the energy-auditing profession. The goal of this standard is to direct the energy auditor to develop a comprehensive list of measures which lead to whole-house, building science-based home performance upgrades to existing detached single-family dwellings and townhouses.

This standard is intended and structured to be used in conjunction with *ANSI/BPI-1200-S Standard Practice for Basic Analysis of Buildings*, which outlines how an energy auditor shall meet the requirements noted in this standard. However, the requirements included in BPI-1100 may also be met using procedures from other American National Standards related to residential building performance. It is understood that other standards or guidelines may be required by the **Authority Having Jurisdiction** (AHJ), and in such instances the energy auditor should comply with the AHJ's requirements.

This *Home Energy Auditing Standard* may be used in conjunction with the U.S. Department of Energy's Home Energy Score. An assessment performed in accordance with the *Home Energy Auditing Standard* will gather all necessary data required by a Home Energy Score Qualified Assessor to develop a Home Energy Score, complete the Appraisal Institute Green Addendum, and provide energy efficiency information into the Real Estate Transaction System for inclusion in the Multiple Listing Service. Home Energy Score is the only federal asset score designed for existing homes, used nationwide, and backed by DOE.

Please note that definitions of all bolded terms throughout the standard can be found in normative Annex A | Terms and Definitions.

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1 Scope

This standard practice defines the minimum criteria for conducting a building science-based residential **whole-building assessment** as specified herein.

The assessment shall include an audit that will address energy usage and limited aspects of building durability, occupant comfort, health and safety. *The audit report* will provide a comprehensive list of prioritized recommendations to improve the energy efficiency of the home and to address related health and safety, comfort, and building durability issues as identified in this standard. *The audit report* will include a cost-benefit analysis.

Residential building types covered herein are defined as: existing detached single-family dwellings, manufactured housing, townhouses, and condos; or as defined by the **Authority Having Jurisdiction**.

2 General Requirements

Energy audits shall be based on generally accepted building science principles and include the use of appropriate equipment in diagnosing opportunities for improving energy efficiency and minimizing health and safety hazards.

2.1 All audits shall include the following:

- 2.1.1 An interview with the homeowner/occupant(s) (if available) about any concerns they may have related to the performance of their home.
- 2.1.2 Immediate disclosure to homeowner/occupant(s) when any suspected emergency or urgent health and safety hazard or situation is present in the home.

2.1.3 Occupant/Homeowner education regarding efficient operation and use of appliances and equipment in the home.

2.1.3.1.4 A report that meets the requirements laid out in this standard.

2.2 All audit reports shall include the following:

- 2.2.1 Results of diagnostic tests and visual/sensory inspections including a summary of the diagnostic testing and inspections and their purpose.
- 2.2.2 Information on energy programs, incentives, regulations, and energy costs relevant to prioritized recommendations for improving the home.
- 2.2.3 A baseline energy-use analysis [when energy-consumption records are available].
- 2.2.4 Information about user-controlled changes that may reduce energy consumption and the value of energy-saving behaviors and measures.

- 2.2.5 Information about the value of water efficiency and conservation strategies and user-controlled changes that may reduce water consumption.
- 2.2.6 A ~~comprehensive~~ set of recommended health and safety measures.
- 2.2.7 A comprehensive set of recommended energy efficiency measures.

3 Health and Safety Related Requirements

The health and safety requirements included in this standard are intended to ensure that home-performance upgrade activities do not negatively affect indoor air quality or otherwise cause or exacerbate an unsafe condition in the home.

The audit shall include the following:

- 3.1 Evaluation of combustion air requirements and a test of combustion appliances in accordance with Section 7 of this standard.
- 3.2 Evaluation of ventilation needs in accordance with Section 8 of this standard.
- 3.3 Identification of existing and/or potential moisture issues in accordance with Section 9 of this standard.
- 3.4 Identification of areas containing known or suspected hazardous materials, including but not limited to, lead, asbestos, or mold.
- 3.5 Visual inspection for existence of an Environmental Protection Agency (EPA) guidelines-compliant radon mitigation system.
- 3.6 Visual inspection for existence of knob and tube wiring.
- 3.7 Identification of obvious electrical hazards.
- 3.8 Evaluation of smoke and carbon monoxide alarms.

4 Disclosure and Ethics

The energy auditor shall act in a professional and ethical manner during the course of conducting all audits, completing audit reports, and interacting with the homeowner/occupants. (See Annex B, Code of Ethics for the Energy Auditor for guidance.)

- 4.1 Energy auditors shall act in the homeowner/occupants' best interest in providing comprehensive recommendations for measures to reduce energy consumption, improve health and safety, and increase the lifespan of the building while also improving the comfort for building occupants regardless to personal benefit to the auditor.

The audit report shall include the following:

- 4.2 Clear and accurate information on home performance upgrades and health and safety improvements.
- 4.3 Method/s used to determine cost benefit of the recommended upgrades.
- 4.4 Disclosure of any current or potential conflict of interest of the auditor.

- 4.5 Disclosure of any products and services that the auditor or his/her company provides in addition to whole-building assessments.

Note: The audit report shall not include recommendations for measures based primarily on a specific product line, services of a contractor, or convenience.

5 Cost-Benefit Analysis

A cost-benefit analysis shall be included in the audit. The cost-benefit analysis shall include an analysis of available energy consumption records to validate estimates of energy savings from the installed home performance upgrades.

- 5.1 A cost-benefit analysis shall include a projected site energy savings associated with the recommended home performance upgrade package(s).
- 5.2 The cost-benefit analysis may be presented in terms of reduced fuel usage, reduced energy costs, a fractional performance improvement over existing performance, or an improvement on a relative scale or benchmark such as a Home Energy Score, Home Energy Rating, or Energy Performance Score. (Note: Energy simulation software is an option, but not a requirement.)
- 5.3 Savings estimates shall clearly indicate whether savings are projected for baseload, heating, cooling, or total household energy consumption.

6 Prioritizing Recommendations

The objective of the prioritized recommendations is to optimize home performance cost-effectively, while maintaining or improving health and safety, occupant comfort, building durability, and satisfying homeowner/occupant/program objectives.

- 6.1 The audit shall include an interview with the homeowner/occupants to understand their goals, priorities, and any potential limitations or barriers for implementing home performance upgrades.
- 6.2 The audit report shall include the following:
- 6.2.1 A list of applicable health and safety improvements within the scope of this standard.
 - 6.2.2 A prioritization hierarchy so that the homeowner/occupant clearly understands priority ranking of the recommended upgrades as established by the AHJ, program or contractor (e.g., health and safety prioritized over energy efficiency and comfort).
 - 6.2.3 A list of home performance upgrades, building repairs and renovation work based on an evaluation of the whole house according to the requirements of this standard and prioritized according to the aforementioned prioritization hierarchy.

7 Combustion Appliance and Fuel Distribution System Inspection

The audit shall include inspection of combustion appliances and fuel distribution systems for safety.

The audit shall include the following:

- 7.1 Identification of building-related health and safety conditions that may require immediate remediation.
- 7.2 Inspection of the ambient air for carbon monoxide (CO) and combustible gas prior to undertaking inspections of fuel distribution systems and combustion appliances.
- 7.3 Testing for gas leakage of accessible natural gas and propane piping systems.
- 7.4 Inspection of oil-fired appliance fuel supply system (tank, supply line, burner) for leaks.
- 7.5 Inspection of combustion venting systems for damage, leaks, disconnections, inadequate slope, and other safety hazards.
- 7.6 Verification that sufficient combustion air is available.
- 7.7 Spillage testing and CO measurement of all atmospherically vented combustion appliances (including **fan-assisted** combustion appliances venting into atmospheric **chimneys** or **flues**) with the combustion appliance zone (CAZ) in a depressurized state.
- 7.8 CO measurement of all **direct vent** and **power-vented** appliances (without atmospheric chimneys or flues) if the outlet of the exhaust is safely accessible.
- 7.9 Testing of gas ovens and unvented appliances for CO.
- 7.10 Inspection of solid fuel burning appliances for safe operation.

8 Indoor Air Quality and Ventilation

The audit shall include inspection of air infiltration sources, air barriers, and **ventilation**. Consider the house ventilation as a system, including both whole-building ventilation and local/[spot](#) exhaust ventilation.

The audit shall include the following:

- 8.1 Identification of sources of indoor air pollutants.
- 8.2 Identification of pathways for pollutants to enter the conditioned space of the home.
- 8.3 Evaluation of terminations of all mechanical ventilation and clothes dryer **vents**.
- 8.4 Evaluation of existing ventilation systems in the dwelling.
- 8.5 Determination of the ventilation needs.

9 Moisture Control

The audit shall include a visual/sensory inspection of each home for moisture issues.

The audit shall include the following:

- 9.1 Inspection for evidence of exterior water intrusion such as roof leaks, foundation leaks, fenestration assembly leaks, and ground-water intrusion.
- 9.2 Inspection for evidence of damage caused by interior water sources such as plumbing leaks or condensation on piping, ductwork, or interior surfaces.
- 9.3 Inspection for effects of water damage on buildings such as structural damage, mold, mildew, efflorescence, and stains.
- 9.4 Identification of existing vapor retarders, flashing, gutters, or other moisture-control strategies.
- 9.5 Evaluation of dehumidification appliance/s operation, condition and efficiency.

10 Building Enclosure

The audit shall include an evaluation of the performance of the **building enclosure**, to include both the **pressure and thermal boundaries** and their combined effectiveness and alignment.

The audit shall include the following:

- 10.1 Evaluation of the envelope insulation level and performance.
- 10.2 Evaluation of the air-leakage of the building, as determined by blower door diagnostic testing.
- 10.3 Evaluation of fenestration performance and fit.
- 10.4 Evaluation of the potential for energy savings of shading and solar-reflectance upgrades for the roof and/or wall.

11 Heating, Cooling, and Domestic Water Heating Systems

The audit shall include an evaluation of the heating, cooling, and domestic water heating systems in the home.

The audit shall include the following:

- 11.1 Evaluation of heating appliance(s) operation, condition, and efficiency.
- 11.2 Evaluation of cooling appliance(s) operation, condition, and efficiency.
- 11.3 Evaluation of heating and cooling distribution system(s) operation, condition, and efficiency.
- 11.4 Evaluation of domestic water heating appliance(s) operation, condition, and efficiency.
- 11.5 Evaluation of domestic water heating distribution system(s) operation, condition, and efficiency.

12 Baseload Energy Efficiency

The audit shall include an estimate of present **baseload energy use** and cost, and a description of the current major appliances and plug loads.

The audit shall include the following:

- 12.1 Evaluation of refrigerator and freezer energy consumption.
- 12.2 Evaluation of lighting efficiency and controls.
- 12.3 Inspection of clothes dryer vents for restrictions, lint build-up appropriate venting configuration and materials.
- 12.4 Evaluation of pool and spa energy consumption and existing conservation strategies.
- 12.5 Evaluation of the efficiency of other major baseload energy-consuming devices.
- 12.6 Collection of information regarding the type and input rate of installed renewable energy systems or other on-site electricity generation.

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Annex A | Terms and Definitions (Normative)

Term	Definition
Authority Having Jurisdiction (AHJ)	<p>The Authority Having Jurisdiction [AHJ] is the organization, office, or individual with final and ultimate authority for approving:</p> <p>Equipment, materials, installation or procedure where jurisdiction includes the governmental or administrative territory within which authority may be exercised, and also the scope of what trades, professions, devices, or systems they regulate.</p> <p>Where public safety is the primary concern, the AHJ may be a federal, state, local, or other regional department or individual such as: a fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. Within federal, state, local, or other regional programs, the program administrator, utility commission, or others having regulatory authority or responsibility for the program may be the AHJ.</p> <p>In many cases, there may be more than one organization, agency, or department that has “jurisdiction” over particular work. However, regulations and statutes establish and define relationships and levels of authority so that only one entity has “authority”. An example of this overlap is the one between an energy program funding source and code officials. If the project in question is a solar/PV project operating under program rules but also subject to State electrical codes, then the funding source can require construction practices only to the extent that the required work does not violate the applicable electrical code. Thereby, the code inspection office (or official) empowered under the state electrical code is the Authority Having Jurisdiction. Additionally, if there is a county or city electrical inspection office, state law identifies the Authority Having Jurisdiction responsible for defining which entity has the highest level of authority and responsibility.</p>
Baseload Energy Use	Energy or fuel that is consumed by household devices that have little to no dependence on outside air temperature including, but not limited to, lighting, kitchen appliances, cleaning appliances, domestic water heaters, and other electronic devices that are frequently or constantly in use.
Building Enclosure	The system or assembly of components that provides environmental separation between the conditioned space and the exterior environment.
Chimney/Flue	One or more passageways for channeling combustion gases to the outdoors.
Combustion Gases	Byproducts of combustion from the appliance (including excess air and dilution air) in the venting system.

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Direct Vent Appliance	A combustion appliance that discharges combustion gasses to the outdoor atmosphere via a closed system (i.e., typically PVC pipe), and is dependent upon all combustion-intake-air being supplied by a closed pipe that is directly connected to the outside atmosphere.
Fan-Assisted Combustion Appliances	An appliance equipped with a mechanical means to draw or force products of combustion through the combustion chamber or heat exchanger.
Flue/Chimney Vent Connector	The pipe or duct that connects a combustion appliance to a flue or chimney.
Power Venting	The application of a mechanical means of removing combustion products to the outside atmosphere.
Pressure Boundary	The barrier that prevents infiltration of outdoor air into the conditioned space and exfiltration of indoor air to the outside. It should be continuous and aligned with the thermal boundary. The pressure boundary is effective if it stops most air leakage.
Spillage	Entry of combustion products into a building from dilution air inlets, vent connector joints, induced draft fan case opening, combustion air inlets, or other locations in the combustion or venting system of a vented combustion appliance (boiler, fireplace, furnace, or water heater), caused by depressurization, improper venting, vent obstruction, or leaks in the venting system.
Thermal Boundary	The insulation boundary that separates conditioned from non-conditioned spaces in a building. It should be continuous and aligned with the pressure boundary.
Unvented Room Heater	Category of unvented, self-contained, free standing, non-recessed (except as noted) fuel gas burning appliance for furnishing warm air by gravity or fan without duct connection. Gas hearth appliances listed to ANSI Standard Z21.11.2 include Gas Fireplaces and Fireplace Inserts.
Vent	An opening or passageway with the sole intent of allowing air, gas, or vapor to pass out of or into a separate space.
Ventilation	The process of supplying outdoor air to or removing indoor air from a dwelling by natural or mechanical means.
Whole-Building Assessment	The evaluation of a house "as-a-system" that considers the interactive effects of the building structure, mechanical systems, environmental factors, and occupants to produce recommendations to improve the indoor air quality, safety, energy efficiency and durability of the dwelling.

Annex B | Code of Ethics for the Energy Auditor (Informative)

(This appendix is not part of the standard. It is informative and does not contain requirements necessary for conformance to the standard.)

The Building Performance Institute, Inc. (BPI) is committed to promoting the highest level of professionalism, integrity, and ability available in the residential contracting industry.

This Code of Ethics for Energy Auditors is designed to foster trust and mutual respect among individuals working in the industry as well as the public at large; it is intended to increase the esteem of the credentials and of the individuals who have earned them. This Code does not discourage healthy competition within the industry. BPI considers industry relationships critical to the industry's success. This Code is also not intended to limit the ability of energy auditors to earn fair compensation for their services. BPI's goal is to promote the professionalism of energy auditors' work products and thereby to enhance their quality.

I. Avoiding Conflicts of Interest

- A. Energy auditors shall not be inappropriately motivated by any financial, personal, or professional purpose other than performing residential energy audits in compliance with this standard.
- B. Energy auditors shall avoid, whenever possible, even the appearance of a conflict of interest and shall disclose all potentially questionable associations and relationships in advance to any stakeholder with a legitimate right to be informed of them.

II. Professionalism and Integrity

- A. Energy auditors shall comply with all safety-related regulations, warnings, and instructions set forth by local, state, or federal organizations and other recognized safety organizations.
- B. Energy auditors shall report any identified safety concerns to the homeowner/occupant.
- C. Energy auditors shall make recommendations based on best practices and standards in the field, using diagnostics, testing, and visual inspection within their areas of education, training, and expertise.
- D. Energy auditors shall provide professional services that effectively guide the homeowner/occupant to reduce energy consumption, improve health and safety, and increase the lifespan of the building while also improving the comfort for building occupants.
- E. Energy auditors shall help the homeowner/occupant to evaluate the costs and benefits of available energy efficiency options in a way that promotes the homeowner/occupant's best interests.

III. Representation of the Energy Auditor Profession and Self-Representation

- A. Energy auditors shall neither misrepresent nor knowingly deceive others concerning their experience and capabilities.
- B. Energy auditors shall act professionally at all times and in the best interests of the homeowner/occupant. Energy auditors shall not act in any way that denies or impedes competent, timely, and professional service to the homeowner/occupant.

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- C. Energy auditors shall not willfully damage, or by negligence or indifference allow to be damaged, any property belonging to the homeowner/occupants. Energy auditors shall take reasonable means to protect the homeowner/occupant's health, safety, property, and possessions and also to prevent the undue loss, theft, waste, and dissipation of the homeowner/occupant's funds, resources, and supplies.
- D. Energy auditors shall not betray the trust that homeowner/occupants have placed in them by inviting them to work in their homes.
- E. Energy auditors shall ensure that any individuals working under their supervision will act in a professional manner, in compliance with all applicable laws, regulations, and standards, and in compliance with all articles specified by this Code of Ethics.

IV. Maintaining Confidentiality

Energy auditors shall not, without permission, disclose private, confidential information about any client for the use or interests of any third parties whose services and opinions have not been explicitly requested by the homeowner/occupant. The energy auditor may discreetly discuss their own work and working conditions with their family and associates, but not in any way that violates the privacy of the homeowner/occupants.

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Annex C | Water Conservation (Informative)

The audit may include an evaluation of all water usage and an assessment of potential water conservation measures.

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