Legend
Black strikethrough = Deleted text
Black underlined text = Added text

Energy Auditor (EA) Redline Changes

The purpose of this document is to illustrate changes between the 2018 EA Job Task Analysis (JTA) and the 2023 EA JTA. The target audience for this resource includes training organizations seeking to update their training curricula or active EA/Quality Control Inspector certification holders interested in viewing recent changes. No immediate changes to certification exams or training requirements are prompted by the JTA or certification scheme updates at this time. However, exams will be updated to align with the new JTAs as part of the national rollout of the updated schemes in late 2024 or early 2025. Use the legend above to identify additions and deletions.

5 EA JTA

5.1 DOMAIN I: Collection of Visual, Material, Dimensional, and Appliance Information About the Building for an Energy Audit

5.1.1 D1-Task 1: Document energy consumption~~.~~

Ability to:

- Obtain 12 months of ~~client~~metered building utility bills
- Obtain unmetered annual fuel ~~delivery~~use information (e.g., oil, propane, solid fuel, etc.).

Knowledge of:

- How to access utility information
- Utility bill ~~components~~and client-stated usage.

5.1.2 D1-Task 2: Document the building history~~.~~

Ability to:

- Determine the age of the original structure
  - ~~Determine the age of any additions or improvements~~
- Determine if the building has ~~any~~ historical significance.

Knowledge of:

- Where to access property record~~.~~
- Historical preservation requirements (e.g., State Historic Preservation Office)
- General construction practices associated with different eras of buildings
- Location of mobile/manufactured homes data plate and information contained therein.

5.1.3 D1-Task 3: Conduct a physical/visual inspection~~.~~ of the building exterior

Ability to:

- Determine orientation of the building
- Identify ~~holes, chimneys, gutters, vent pipes, soffits, fascia, peeling paint, foundation~~ components or issues that affect the structural integrity, ~~areas of infiltration and exfiltration,~~

~~exhaust fan penetrations, accesses, crawl spaces, roof~~ durability, and energy efficiency of the building (e.g., holes, vents, land grading, shading, ~~orientation of the building, and anomalies~~crawl space access, etc.)
    - ~~Identify pest/vermin infestations, evidence of leaking or water damage, and structural damage~~
    - ~~Identify hidden rooms or spaces~~
- Identify mechanical penetration locations and compare with interior mechanical systems (e.g., exhaust fan terminations, chimneys, flues, etc.)
- Identify the cladding materials (e.g., siding, foundation, roofing, etc.)
    - Identify ~~the exterior materials (e.g., vinyl, brick)~~
    - ~~Identify issues that would interfere with or prevent tests~~
    - ~~Identify potentially hazardous materials in the building~~
    - ~~Detect abnormalities by using all senses (e.g., unusual odors, sounds)~~
    - ~~Identify health and safety~~ issues ~~(e.g., clutter, bleach stored next to a furnace, asbestos-containing materials)~~
    - ~~Perform visual inspection of a vented combustion appliance venting configuration~~
    - ~~Identify a combustion appliance zone (CAZ)~~
- ~~Visually inspect~~on adjacent and/or connected buildings ~~for issues~~ that could impact or ~~could~~ be impacted by the audited building
- ~~Determine~~ Identify evidence of pest/vermin infestations
- Identify evidence of water and/or structural damage
- Identify combustion appliance venting terminations.

Knowledge of:

- General construction (e.g., techniques, terminology, materials)
- Applicable codes and standards (e.g., International Codes Council [ICC~~,~~], National Fire Prevention Association [NFPA~~). Knowledge of:~~])
    - ~~Combustion appliance venting procedures~~
    - ~~Issues that pose a health and/or safety risk (e.g., clutter, bleach stored next to a furnace, animal feces, asbestos-containing materials, hazardous materials)~~
- Healthy homes principles
- Situations that pose a health and/or safety risk
- Sources of moisture
- Occupational Safety and Health Administration (OSHA) safe work practices
- Abnormalities identified through other senses (e.g., ~~confined spaces).~~unusual odors, sounds)
- Building science principles
- Geographical orientations
- Flood plains
- Mobile/manufactured homes construction (e.g., techniques, terminology, materials).

5.1.4 D1-Task 4: ~~***Collect health and safety data.***~~***Conduct a physical/visual inspection of the building interior***

Ability to:

- ~~Locate existing~~Identify components or issues that affect the structural integrity, durability, and energy efficiency of the building and the indoor environment (e.g.,

soffits, drop ceilings, ceiling penetrations, exhaust fans, electrical, plumbing and venting, interior building materials, damaged surfaces, etc.)
- Identify evidence of structural damage, water damage or leaking, and pest/vermin infestations
- Identify hidden or inaccessible spaces (e.g., crawl spaces, attics, interstitial areas)
- Identify conditions that would interfere with or prevent tests (e.g., active solid fuel burning, large hole in pressure boundary, nonfunctional appliance, lack of fuel, indoor air contaminants, etc.)
- Identify potentially hazardous materials in the building (e.g., asbestos, mold, lead, etc.)
- Identify health and safety issues (e.g., clutter, volatile organic compounds, lack of handrails, electrical hazards, etc.)
- Identify combustion appliance zone(s) (CAZ).

Knowledge of:

- General construction (e.g., techniques, terminology, materials)
- Applicable codes and standards (e.g., ICC, NFPA)
- Healthy homes principles
- Situations that pose a health and/or safety risk
- Sources of moisture
- OSHA safe work practices
- Abnormalities that may be identified through other senses (e.g., unusual odors, sounds)
- Building science:
    - Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).

5.1.5 D1-Task 5: Collect health and safety data

Ability to:

- Determine the presence and condition of smoke~~/~~ and carbon monoxide alarms
    - ~~Determine age and functionality of smoke/carbon monoxide alarms~~
    - ~~Determine if smoke/carbon monoxide alarms are hardwired or battery-powered~~
- Verify that ~~a~~ clothes ~~dryer is~~dryers are properly vented to the exterior
- Verify that all exhaust fans are properly vented to the exterior
- ~~Identify~~Document any existence of hazardous materials/conditions
    - ~~Identify knob-and-tube wiring~~
- ~~Identify~~Document moisture issues (e.g., standing water, condensation, plumbing leaks, mold~~)~~, etc.)
- ~~Identify~~Document potential electrical hazards (e.g., frayed wiring, open junction boxes, overloaded circuits~~)~~, active knob-and-tube wiring, etc.)
- ~~Identify~~Document suspected asbestos-containing materials
- ~~Identify~~Document potential lead-based paint hazards
- ~~Identify~~Document vented and unvented combustion appliances
    - ~~Identify a properly operating backdraft damper~~
- ~~Identify~~Document conditions that promote radon infiltration

- ~~Identify~~Document other potential indoor air quality hazards (e.g., volatile organic compounds~~).~~, indoor smoking, etc.).

Knowledge of:

- ~~Proper locations for smoke/carbon monoxide alarms~~
- ~~Venting requirements for appliances~~
- ~~Conditions that signify or promote moisture problems~~

- Applicable codes, standards, and program requirements (e.g., ICC, NFPA, Asbestos Hazard Emergency Response Act, etc.)
- Healthy homes principles
- Domestic water heater safety
- Electrical hazards
- Hazardous materials
- Heating system safety
- ~~How to determine if~~ Knob-and-tube wiring ~~is active~~
- Issues and hazards associated with asbestos-containing materials
- Issues and hazards associated with lead-based paint
  - ~~Manufactured home water heater regulations~~
  - ~~Rules and regulations pertaining to lead and asbestos-containing materials~~
- Mobile/ manufactured homes combustion appliance regulations (see U.S. Department of Housing and Urban Development standard)
- Use of building cavities as supply or return air pathways
- Operation of smoke/carbon monoxide ~~alarm operations.~~alarms
- Issues and hazards associated with radon
- Radon zones.

~~5.1.5~~5.1.6 D1-Task ~~5~~6: Collect appliance and base load information~~.~~

Ability to:

- Collect household appliance tag data (e.g., refrigerator, dishwasher, dehumidifier~~)~~, etc.)
- Collect heating~~/cooling~~, ventilation, and air conditioning (HVAC) and water-heating appliance tag data and documentation
  - ~~Determine combustion appliance zone (CAZ) volume~~
- ~~Identify~~Document appliance energy source(s)
- ~~Collect~~Document water fixture flow rates
- ~~Identify~~Document type, location, and use of thermostats
- Document other components related to the HVAC appliances (e.g., expansion tanks, fill valves, remote compressors, ~~smart thermostats)~~etc.)
- ~~Identify~~Document other components related to the domestic water ~~heater appliance (~~heating appliances (e.g., storage tanks, mixing valves, etc.)
- Identify safety features related to the HVAC and ~~domestic~~ water ~~heater~~ heating appliances
- Collect lighting data (e.g., type, fixtures, wattage, usage)
- ~~Identify~~Document the number of occupants
- ~~Determine~~Identify appliances that use energy (e.g., Audio Visual, freezers, pool equipment, etc.)
- Document client energy ~~usage~~ use habits ~~(e.g., A/V, computers)~~
  - ~~Look for additional usage sources (e.g., hot tubs, pool pumps, pool heaters, fish ponds,~~

~~fountains)~~
  - ~~Collect electrical service information (e.g., size, brand)~~
- ~~Identify base loads.~~, amperage, etc.).

Knowledge of:

- ~~Various~~ Appliance types and energy sources
  - ~~Codes and standards adopted by the authority having jurisdiction (e.g., NFPA 54)~~
- Applicable codes, standards, and program requirements
- Domestic water ~~heater~~heating types, components, and operation
- Heating/cooling system ~~operations~~types, components, and operation
- Safety issues associated with domestic water ~~heaters~~ heating systems
- Thermostat set points, backup set points for heat pumps
- Water fixture operations and flow rates
- ~~Domestic hot~~Mobile/ manufactured homes appliance types
- Alternative domestic water-heating technologies (e.g., heat pump water heater, solar thermal, indirect, etc.)
  - ~~How occupant behavior affects energy consumption~~
- ~~The~~ Definition of base load
- Utility bill analysis, including base load calculation~~.~~
- Electrical system components (e.g., breaker box, fuse box, etc.).

~~5.1.6~~5.1.7 D1-Task ~~6: Identify a~~7: Collect conditioned building enclosure~~.~~ data

Ability to:

- ~~Identify and record~~Document pertinent building dimensional data (e.g., footprint, height, elevations, volume, etc.)
- Determine conditioned, unconditioned, and unintentionally conditioned spaces
- Assess alignment of thermal and pressure boundaries.

Knowledge of:

- Pressure boundary identification
- Thermal boundary identification
  - ~~Various building components~~
- Proper pressure and thermal boundary alignment.

~~5.1.7~~5.1.8 D1-Task ~~7~~8: Collect mechanical ventilation data~~.~~

Ability to:

- Collect ~~tag~~nameplate data for ~~exhaust fans~~ventilation systems/equipment
  - ~~Determine the volume of the affected space~~
- Determine the type of control (e.g., continuous, intermittent, or on-demand)
- Determine the condition of the ventilation ductwork/piping (e.g., pitch, insulation, size, material, elbows, length of run, terminations~~).~~, etc.).

Knowledge of:

- Controls and motors
- Types of ventilation
- Ventilation ductwork
- ~~Ventilation~~Applicable codes, standards, and ~~codes of authority having jurisdiction.~~program requirements (e.g., ASHRAE 62.2).

~~5.1.8~~5.1.9 D1-Task ~~8: Identify~~9: Collect building insulation ~~(~~data (roof, attic, walls, and foundation/~~subspace).~~subspaces)

Ability to:

- ~~Identify~~Document insulation type(s)
- Measure insulation (e.g., thickness, depth)
- ~~Identify~~Document insulation condition~~ and~~
- Document insulation coverage
- ~~Identify~~Document presence and placement of vapor ~~retarder~~retarders
- ~~Identify the location of~~Document roof insulation (e.g., ~~exposure, aligned~~flat roofs with ~~pressure~~rigid insulation board, etc.)
  - ~~Document and thermal boundaries).~~
- evaluate the mobile/ manufactured homes road barrier/belly.

Knowledge of:

- ~~Building science~~
- Insulation types
- Insulation effectiveness
- Insulation R-values
- Effective R-values
- Insulation ~~placement~~installation best practices
- OSHA safety requirements
  - ~~General thermography principles.~~
- How to interpret infrared imaging
- Mobile/manufactured homes insulation installation best practices
- Vapor retarders.

~~5.1.9~~5.1.10 D1-Task ~~9~~10: Collect attic data~~.~~

Ability to:

- ~~Identify~~Document attic ~~components~~details (e.g., drop soffit, rafters, joists~~)~~, inaccessible areas, floored areas, bowstring truss, half truss roof, marriage wall, etc.)
- ~~Determine~~Document attic type (e.g., finished, unfinished, knee-wall, cathedral, etc.)
- Document existing attic ventilation type and size (e.g., soffit~~,~~ vents [baffles], ridge, power ~~ventilators)~~roof vent, etc.)
- ~~Identify heat sources (e.g.,~~Document potential fire hazards (e.g., non-insulation contact (IC) rated recessed lights, heat lamps, chimneys, flues, furnaces~~)~~, electrical devices, etc.)
- ~~Identify~~Document sources/~~signs~~evidence of water damage
  - ~~Identify bypasses between attic and conditioned space~~
- ~~Identify~~Document air leakage in the pressure boundary (e.g., penetrations, chases, balloon framing, top plate, knee wall, etc.)
- Document bypasses, misalignments, or missing insulation in the thermal boundary
- Document types, locations, and ~~point(s)~~conditions of access
- ~~Identify~~Document potential electrical hazards
- ~~Identify~~ Document evidence of pest/vermin infestations
- ~~Recognize~~Document potential structural integrity issues
- ~~Identify a~~ Document presence and condition of whole-house ~~fan~~fans
- Determine attic uses (e.g., storage, finished, unfinished, etc.)
  - ~~Note~~Document the ~~existence~~presence and ~~effectiveness~~condition of any radiant barriers
- ~~Identify the existence of baffles.~~.

Knowledge of:

- Attic components
- General construction ~~terms~~(e.g., techniques, terminology, materials)
- ~~Infiltration~~Air leakage points
- Required clearance to combustibles
- Potential safety hazards ~~in an attic~~ (e.g., electrical hazards, nails, rafters, heat exposure~~)~~, etc.)
- Signs of water damage
- ~~Signs~~Sings of pest/vermin infestations
  - ~~General thermography principles~~
- How to interpret infrared imaging
- Ventilation requirements
- ~~OSHA~~OHSA safety requirements (e.g., ladder usage, confined spaces~~).~~, personal protective equipment, etc.)

~~6.1.2 D1-Task 10: Collect wall data.~~

~~Ability to:~~

- ~~Identify wall types and~~Attic components ~~(e.g., interior, exterior)~~for mobile/manufactured homes.
  - ~~Identify framing method~~
  - ~~Identify wall orientation~~
  - ~~Identify sources and signs of any water damage~~

- ~~Identify infiltration points~~
- ~~Identify signs of pest/vermin infestation~~
- ~~Identify upper stories~~
- ~~Identify wall exposure.~~

~~Knowledge of:~~

- ~~General construction~~
- ~~Building science~~
- ~~Infiltration points~~
- ~~Typical wall framing and components~~
- ~~Issues unique to framing methods (e.g., use of upper story band joists, angle bracing in post and beam framing)~~
- ~~General thermography principles.~~

~~5.1.10~~5.1.11 D1-Task 11: Collect ~~window and door~~wall data~~.~~

Ability to:

- ~~Identify window type~~ Document wall thickness and/or cavity depths
  - Document wall types (e.g., ~~jalousie, awning, single-hung, double-hung~~)
- ~~Identify window~~masonry, adobe, balloon frame~~ material~~, platform frame, etc.)
  - ~~Identify window glazing type (e.g., reflective, low-E)~~
  - ~~Identify exterior shading~~
  - ~~Identify window operation/leakiness~~
- ~~Identify window~~Document wall finishes (e.g., stucco, brick, vinyl, metal, wood, drywall, plaster, paneling, etc.)
- Document wall components (e.g., back plastering, tar paper, fire blocking, etc.)
- Document presence and type of wall insulation
- Document wall orientation
  - ~~Identify general window conditions~~
  - ~~Identify door type~~Document sources and ~~swing~~
- ~~Identify condition~~evidence of ~~a door, including hardware, door sweep, seals, and operation~~water damage
- ~~Determine thermal characteristics of a door.~~ Document air leakage locations
- Document evidence of pest/vermin infestation
- Document wall exposure (e.g., above grade, below grade, buffered, etc.).

Knowledge of:

- ~~Environmental Protection Agency (EPA) safety requirements~~
- ~~Historical preservation requirements~~

- ~~Window~~General construction~~, components, and nomenclature~~ (e.g., techniques, terminology, materials)
  - ~~Door components, hardware, and nomenclature~~
- ~~Door~~Mobile/manufactured homes construction (e.g., techniques, terminology, materials)
  - ~~Door operation and adjustments.~~
- Air leakage points
- Typical wall framing and components (e.g., platform, balloon, post and beam, etc.)
- Unique characteristics of framing methods (e.g., use of upper-story band joists, angle bracing in post and beam framing, etc.)
- How to interpret infrared imaging.

~~5.1.11~~5.1.12 D1-Task 12: Collect ~~foundation/subspace~~ window and door data~~.~~

Ability to:

- ~~Identify~~Document window and door dimensions
- Document window and door locations and orientations
- Document window types (e.g., jalousie, awning, single-hung, double-hung, storm, etc.)
- Document window frame materials (e.g., wood, metal, vinyl, fiberglass, etc.)
- Document window glazing types (e.g., single pane, double pane, triple pane, reflective, low-E, etc.)
- Document presence and coverage of interior and exterior shading
- Document condition of windows, including hardware, seals, and operation (e.g., air leaks, water leaks, locks, cracks, missing glazing, rotted sashes, lead paint, etc.)
- Document door type and materials (e.g., french doors, dutch doors, in or out swing, insulated, metal, wood, solid core, hollow core, etc.)
- Document condition of doors, including hardware, door sweep, seals, and operation (e.g., air leaks, water leaks, locks, cracks, missing glazing, rotted sashes, lead paint, etc.).
- Determine thermal characteristics of windows and doors (e.g., R-value, glazing, etc.).

Knowledge of:

- Mobile/manufactured homes window and door construction, components, hardware, and terminology/nomenclature
- Presence of lead paint
- Window and door construction, components, hardware, and nomenclature
- R- and U-values
- Emissivity of glass.

5.1.13 D1-Task 13: Collect foundation/subspace data

Ability to:

- Document foundation/subspace types (e.g., crawl space, basement, slab~~)~~ on grade, etc.)

- ~~Identify~~Document foundation materials (e.g., post and beam, piers, skirting, poured concrete, masonry blocks, etc.)
  - ~~Identify infiltration points~~
- ~~Identify~~Document air leakage in the pressure boundary (e.g., penetrations, chases, balloon framing, sill plate, rim joist, etc.)
- Document bypasses, misalignments, or missing insulation in the thermal boundary
- Document foundation/subspace existing ventilation type and size (e.g., crawl space vents, etc.)
- Document potential sources and ~~signs~~evidence of moisture issues (e.g., presence or condition of ground vapor retarder, standing water, leaks, mold, ground cover-dirt, etc.)
- ~~Identify points~~Document type, locations, and conditions of access
- ~~Identify~~Document potential electrical hazards
- ~~Identify signs~~Document evidence of pest/vermin infestations
- ~~Recognize~~Document potential structural integrity issues
- ~~Identify~~Document special equipment (e.g., sump pumps~~). Knowledge of:~~, dehumidifiers, heat tape, etc.)
  - ~~Building science~~
- ~~Codes and~~ Document and evaluate the mobile/ manufactured homes road barrier/belly.

Knowledge of:

- Applicable codes, standards ~~adopted by the authority having jurisdiction~~, and program requirements
- Crawl space ventilation requirements
- Foundation construction materials and methods
- ~~OSHA~~OHSA safety requirements (e.g., ladder usage, confined spaces, personal protective equipment, etc.)
- Signs of structural hazards on foundations~~.~~
- How to interpret infrared imaging
- Signs of pest/vermin infestations
- Mobile/manufactured homes belly and skirting construction materials and methods.

~~5.1.12~~5.1.14 D1-Task ~~13~~14: Collect roof data~~.~~

~~Ability to:~~

- ~~Identify~~Document roof types (e.g., parapet, mansard, gambrel, gable~~)~~, etc.)
  - ~~Identify roof conditions~~
- ~~Identify~~Document roof condition(s) (e.g., debris, age, deterioration, damage, etc.)
- Document roof color(s)
- ~~Identify~~Document roofing materials (e.g., ~~underlayment,~~ membrane, shingle, metal~~)~~, etc.)
- ~~Identify~~Document roof penetrations (e.g., skylights, chimneys, vents, etc.)
  - ~~Identify roof debris (e.g., garbage, old air conditioners)~~
- ~~Identify~~Document the presence and condition of roof drainage (e.g., slopes, gutters, downspouts, etc.)
- ~~Determine~~Document the flashing condition (e.g., missing, damaged, deteriorated etc.)

- ~~Identify type and location of~~Document roof ~~access~~
- ~~Identify roof exposure~~shading and orientation
- ~~Identify roof insulation (e.g., flat roof with no cavity and with rigid insulation)~~
- ~~Determine~~Document roof pitch.

Knowledge of:

- Insulation materials and methods
- OSHA ~~safety~~ requirements (e.g., ladder usage, confined spaces, personal protective equipment, etc.)
- Roofing construction methods
- Roofing materials~~.~~
- Mobile/ manufactured homes roofing construction methods and materials.

5.2 DOMAIN II: Diagnostic Testing of the Dwelling Unit for an Energy Audit

5.2.1 D2-Task 1: Prepare the dwelling unit for the test(s~~).~~)

Ability to:

- Determine the test(s) to be performed (e.g., blower door test, duct leakage test, combustion safety testing~~)~~, etc.)
- Prepare the building and equipment for testing based upon industry protocols.

Knowledge of:

- Building diagnostic testing (e.g., set building for wintertime conditions, zero out equipment, etc.)
- ~~Building science~~
- Test protocols.

5.2.2 D2-Task 2: Test the electric appliances~~.~~

Ability to:

- Inspect appliances for test accessibility
- ~~Follow~~Determine the ~~manufacturer's guidelines for operation of the watt-hour meter~~
- ~~Interpret data from~~ appliance(s) energy usage (e.g., using a watt-hour meter
- ~~Access wattage usage~~, using data ~~in~~from an ~~up-to-date~~ industry-accepted resource~~.~~, etc.).

Knowledge of:

- Electric appliance metering
- Manufacturer's instructions/guidelines
- Electric appliance safety.

5.2.3 D2-Task 3: ~~Conduct~~Test indoor air quality ~~tests.~~

Ability to:

- Measure levels of targeted indoor air pollutants (e.g., carbon monoxide, combustible gases~~)~~, etc.)
- Determine if the ~~reading exceeds~~pollutants exceed any applicable action levels
- ~~Identify~~Determine need for further

testing.

Knowledge of:

- ~~Carbon monoxide~~Indoor air pollutant exposure ~~symptoms~~systems
- ~~Industry~~Indoor air pollutant action levels
- Applicable codes, standards ~~relative to air quality~~, and program requirements (e.g., ASHRAE~~, EPA, NIOSH~~ 62.2, U.S. Environmental Protection Agency, National Institute for Occupational Safety & Health, OSHA~~)~~, etc.)
- ~~Effect of~~ How to measure relative humidity ~~on indoor air quality~~
- Source ~~control~~ of pollutants~~.~~
- Safe entry procedures.

5.2.4 D2-Task 4: Determine the safety and efficiency of combustion appliances~~.~~

Ability to:

- ~~Visually~~ Inspect the fuel supply lines

- ~~Test~~ for ~~leakage in the fuel supply pipes~~issues (e.g., ~~confirm with bubble solution)~~leaks, kinks, corrosion, etc.)
- Perform combustion safety tests (e.g., ~~combustion appliance zone [~~CAZ~~] test~~ depressurization ~~test~~and spillage, carbon monoxide ~~test)~~, etc.)
- ~~Conduct~~Perform combustion ~~efficiency tests~~analysis (e.g., oxygen, stack temperature, steady-state efficiency ~~[SSE]).~~, carbon monoxide, oil burner smoke test, etc.)
- Perform inspection of combustion appliance venting (e.g., sizing, condition, configuration, etc.)
- Determine the presence and condition of associated equipment (e.g., backdraft dampers, power vents, barometric damper, sight glass, water level controls, direct vent appliance intakes, etc.)
- Measure CAZ volume
- Measure ambient carbon monoxide levels during testing.

Knowledge of:

- ~~Building science~~
- ~~Codes and standards adopted by the authority having jurisdiction~~

- Mobile/manufactured homes combustion appliance regulations (e.g., U.S. Department of

Housing and Urban Development standard 24 CFR Part 3280)
- Applicable codes, standards, and program requirements (e.g., NFPA, etc.)
- Combustion efficiency test procedures (e.g., oxygen, stack temperature, steady-state efficiency ~~[SSE])~~, etc.)
- Fuel line leak testing techniques applicable to each fuel type
- Heating system type (e.g., forced air heater, hydronic heater, steam heater, unit heater, space heater~~)~~, wood burning, etc.)
- Annual fuel utilization efficiency ~~(AFUE)~~ versus steady-state efficiency ~~(SSE)~~
- Combustion safety test procedures
- Venting types, materials, methods, and safety issues (e.g., venting categories~~, NFPA~~)
  - ~~Greatest depressurization achievable (i.e., worst case).~~
- CAZ testing protocols
- Clearance to combustibles.

5.2.5 D2-Task 5: Determine air leakage of the building envelope~~.~~

Ability to:

- ~~—~~Perform blower door tests

- ~~Follow~~ to industry ~~protocol for conducting blower door tests~~standards
- Perform single point zone pressure diagnostics (~~ZPD)~~e.g., garages, crawl spaces, attics, etc.)
- Perform pressure pan tests
  - ~~Locate~~Determine points of infiltration/exfiltration

~~Identify air leakage locations based on~~ (e.g., infrared ~~images.~~ , smoke, sensory, etc.).

Knowledge of:

- Advanced blower door diagnostics (e.g., zone pressure diagnostics, pressure pans~~)~~, manometer, etc.)
- Blower door testing procedures (e.g., ~~pressurization, depressurization)~~when and how to pressurize or depressurize, etc.)
- Blower door assembly and operation~~.~~
- How to interpret infrared imaging
- Industry-recognized blower door testing standards.

5.2.6 D2-Task 6: Determine the performance of HVAC distribution~~.~~

Ability to:

- ~~Perform HVAC distribution tests~~

- Perform a duct leakage test on a forced air system ~~distribution leakage test~~
- Measure room temperatures
- ~~Measure the temperatures of the~~Determine if hydronic radiators are operating
  - ~~Measure air flow (i.e., cubic feet per minute [CFM])~~
- Measure the supply and return of water temperature in a hydronic distribution system
- Locate points of duct leakage

- Measure temperature rise across heat exchangers/cooling coils
- Measure static pressure
- Inspect hydronic distribution ~~(e.g., high, low, valves)~~for leaks
- ~~Measure room~~ Determine the need for pressure ~~differences for forced air systems~~balancing
- Measure mechanical ventilation flow rates (e.g., exhaust fans, supply fans, balanced ventilation~~).~~, etc.).

Knowledge of:

- HVAC distribution testing protocols (e.g., total duct leakage, duct leakage to outside, use of a pressure pan, etc.)
- HVAC terminology (e.g., air handler, trunk line, supply/return, crossover duct, etc.)
- Manufacturer's specifications
- Distribution system design and materials (e.g., forced air ~~systems~~, hydronic, etc.)
  - ~~Hydronic distribution~~
- Best practices for duct sealing
- Mobile/manufactured homes return duct modification techniques
- Mechanical ventilation systems (e.g., exhaust, supply, balanced~~).~~, etc.)
- Applicable codes, standards, and program requirements (e.g., ASHRAE 62.2, Air Conditioning Contractors of America, etc.)
- Air flow testing protocols (e.g., exhaust fan flow meter, etc.)
- Pressure balancing testing and techniques (e.g., undercut door, return air pathway, jumper duct, etc.).

5.3 DOMAIN III: Evaluation of Collected Energy Audit Data to Determine the Scope of Work

5.3.1 D3-Task 1: Evaluate the health and safety data~~.~~

Ability to:

- Determine ~~if there are~~ potential health and safety concerns
- Determine if health and safety issues can be addressed through an energy ~~-~~efficiency measure
- Determine the repair options.

Knowledge of:

~~Special circumstances~~Potential contaminants as related to work scope (e.g., mold, lead, asbestos-containing materials, radon~~),~~, etc.)

  - ~~Construction repair methods.~~
- Repair/remediation methods (e.g., fix plumbing leak, lead-safe work practices, radon mitigation, etc.)
- The need for specialty licensure (e.g., asbestos remediation/encapsulation, knob and tube removal, etc.)
- Applicable codes, standards, and program requirements.

5.3.2 D3-Task 2: Evaluate the durability/structural integrity of the building~~.~~

Ability to:

- Determine ~~if there are~~ potential durability/structural integrity issues
  - ~~Determine if the potential durability/structural integrity issues can be addressed through an energy-efficiency measure~~
- Determine the repair options
- Determine if further evaluation is recommended.

Knowledge of:

- Building science~~.~~:
  - Heat transfer mechanisms (e.g., convection, conduction, radiation)
  - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
  - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- General construction (e.g., techniques, terminology, materials)
- General mobile/manufactured homes construction (e.g., techniques, terminology, materials)
- Applicable codes, standards, and program requirements.

5.3.3 D3-Task 3: Evaluate the HVAC system~~.~~

Ability to:

- ~~Evaluate the HVAC system for~~Determine if there are health and safety concerns (e.g., suspected asbestos-containing materials~~)~~, etc.)
- ~~Evaluate~~Determine HVAC sizing for ~~potential replacement or upgrades (e.g., post shell retrofit)~~building
- Evaluate the need for distribution ~~(e.g., add trunk lines, radiators, to rooms as needed)~~modification
- Evaluate fuel-switching options
- ~~Evaluate~~Determine the need to clean and tune ~~versus~~, repair, or replace
- Evaluate the need for and supply of combustion air
- Evaluate the HVAC system for ~~other issues that lead to~~ replacement or upgrades (e.g., condition, age, efficiency~~)~~, sizing, etc.)
- ~~Identify~~Determine duct sealing/insulation and pipe insulation

opportunities.

Knowledge of:

- HVAC load and sizing calculations (e.g., Air Conditioning Contractors of America ~~(ACCA) manuals~~manual D, J, S, T, etc.)
- General heating/cooling system function and operations
  - ~~HVAC load calculations~~
- Combustion air requirements
- HVAC system repair, replacement, or upgrade options
- ~~Maximum allowable~~Program requirements related to duct leakage
- ~~Safety~~Combustion vent sizing and installation requirements
- Applicable codes, standards, and program requirements (e.g., ~~NFPA, AHJ).~~ASHRAE 62.2)

- Air-Conditioning, Heating, and Refrigeration Institute equipment certification
- Mobile/manufactured homes approved HVAC equipment
- Fuel delivery sizing and installation requirements (e.g., pipe sizing, electrical service, etc.).

5.3.4 D3-Task 4: Evaluate the mechanical ventilation~~.~~

Ability to:

- Compare measured flow with ventilation requirements
- Determine the mechanical ventilation needs (e.g., repairs, replacements, additions, make-up air~~)~~, etc.)
- Determine the type of ventilation controls needed
- Calculate the building ventilation requirements.

Knowledge of:

- ~~Ventilation~~ Applicable codes, standards, and program requirements (e.g., ASHRAE~~, AHJ~~ 62.2)
- Mechanical ventilation systems and controls
- Optimal ventilation strategy based on client/program needs (e.g., optimize indoor air quality, avoid excessive CAZ depressurization, repair existing fans to reduce costs, etc.)
  - ~~•~~ Ventilation ~~strategies~~
- ~~Ventilation ducting design~~system sizing and installation.

5.3.5 D3-Task 5: Evaluate energy use~~.~~

Ability to:

- Determine if replacements or upgrades will reduce energy consumption
- Analyze utility bills and fuel usage~~,~~ and calculate base

loads.

Knowledge of:

  - ~~Codes and standards adopted by the authority having jurisdiction~~

- ~~Components of~~ Base loads (e.g., lighting, electronics, domestic hot water, appliances~~)~~, etc.)
- Base load calculation
- Seasonal loads (e.g., heating, cooling, etc.)
- Base load reduction strategies~~.~~ (e.g., reduce the number of appliances, client education, etc.)
- How occupant behavior affects energy consumption
- Unusual energy-use patterns.

5.3.6 D3-Task 6: Evaluate the foundation/subspace~~.~~

Ability to:

- Determine if repairs are needed (e.g., plumbing, floors~~)~~, etc.)
- Determine if ~~additional~~ insulation and/or air sealing is needed
- Determine the proper location for insulation and/or air sealing (e.g., floor, walls, sills,

perimeter, cantilever floor~~)~~, etc.)
- Determine the type of insulation materials to be added
- Calculate ~~if adequate~~required ventilation ~~exists or should be added~~and determine if the existing ventilation is appropriate
- Determine a moisture management strategy (e.g., site ~~drain~~drainage, vapor barrier~~).~~, etc.).

Knowledge of:

- Building science:
  - ~~Codes and standards adopted by the authority having jurisdiction~~
    - Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- Foundation construction ~~techniques~~types (e.g., poured, block, rubble, limestone, etc.)
- Insulation density requirements and bag count calculations
- Foundation crawl space ventilation strategies (e.g., vented versus unvented, etc.)
- Foundation crawl space requirements
- Applicable codes, standards, and program requirements (e.g., International Residential Code, ICC, etc.)
- Foundation/subspace insulation (e.g., types, strategies, requirements)
- Foundation/subspace types (basements, crawl spaces, inaccessible crawl spaces, conditioned/unconditioned, slab, etc.)
- ~~Types and~~ Vapor barriers (e.g., types, locations~~ for vapor barriers.~~, purposes, etc.)
- Mobile/ manufactured homes floor and skirting construction/insulation (e.g., types-wings, joist directions, square belly, round belly, flat belly, etc.)
- OSHA safety requirements (e.g., ladder usage, confined spaces, personal protective equipment, etc.).

5.3.7 D3-Task 7: Evaluate the walls~~.~~

Ability to:

- Determine if repairs are needed
- Determine if insulation opportunities exist
- Determine if air-sealing opportunities exist
- ~~Identify~~Determine the type of insulation materials to be added
- Determine the square footage of the area to be insulated
- Determine if the pressure boundary and thermal boundary align
- Determine if the vapor retarder is present and appropriately placed
- Determine if band joists insulation and/or air-sealing opportunities exist (~~i.~~e.g., upper stories)
- Determine the impact of potential health and safety issues (e.g., lead-based paint, asbestos-containing materials, electrical hazards, moisture~~)~~, etc.)
- Determine a moisture management strategy (e.g., drainage, flashing~~).~~,

etc.).

Knowledge of:

- ~~EPA~~U.S. Environmental Protection Agency and DOE lead and asbestos standards
- Building science:
    - ~~Codes and~~ Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- Applicable codes, standards ~~adopted by the authority having jurisdiction~~, and program requirements
- Insulation types, techniques, and ~~appropriateness~~strategies
- Pressure and thermal boundaries
- Mobile/manufactured homes wall insulation types, techniques, and strategies (e.g., batt stuffing, blown fiberglass, etc.)
- Typical site-built wall structures (e.g., platform, balloon, post and beam, etc.)
- Vapor retarder placement in walls~~.~~ based on climate
- Moisture management strategies
- Typical R-values of insulation materials
- Gross versus net wall area calculation
- Insulation density requirements and bag count calculations
- Typical mobile/manufactured homes wall structures and materials (e.g., belt rails, cavity depth, cladding, etc.).

5.3.8 D3-Task 8: Evaluate the attic~~.~~

Ability to:

- ~~Evaluate~~Determine if repairs are needed
- Determine if insulation opportunities exist
- Determine the type of insulation materials to be added
- Determine if air-sealing opportunities exist
- Determine if the vapor ~~retarder~~barrier is present and appropriately placed
- Calculate required ventilation and determine if ~~additional attic~~ the existing ventilation is ~~required~~appropriate
- Determine if ~~additional~~attic access ~~is required~~must be created or changed
- Determine the impact of potential health and safety issues (e.g., heat sources, asbestos-containing materials, obvious electrical hazards, moisture~~).~~, etc.)
  Determine needed attic preparation (e.g., baffles, rulers, boxing/damming, stored items, etc.).

Knowledge of:

- Attic construction and materials
- Attic fire hazards
- ~~Attic~~Mobile/manufactured homes insulation and air-sealing strategies

- Attic insulation and air-sealing strategies
- Attic ventilation standards
- Mobile/manufactured homes attic ventilation standards and best practices
- Mobile/manufactured homes roof/attic construction and materials
- Building science:
    - ~~Codes and~~ Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- Applicable codes, standards ~~adopted by the authority having jurisdiction~~, and program requirements
- Pressure and thermal boundaries
    - ~~Moisture management~~
- Insulation density requirements and bag count calculations
- Repair techniques (e.g., ceiling, roof, and framing repair, etc.)
- Preparation needed for attic insulation and air sealing (e.g., moving stored materials, fixing roof leaks, electrical repair, etc.)
- Area-weighted average R-value~~.~~ (e.g., parallel path).

5.3.9 D3-Task 9: Evaluate the doors and windows~~.~~

Ability to:

- Determine if ~~repairs are needed~~door and window components must be repaired or replaced
- Evaluate the condition of and/or need for storm doors and windows ~~(e.g., closers)~~
- Evaluate door and window components and performance
- Determine if insulation opportunities exist
- Determine if air-sealing opportunities exist
- Determine the impact of potential health and safety issues (e.g., lead-based paint, asbestos-containing materials, moisture~~).~~, etc.)
- Determine if window film opportunities exist.

Knowledge of:

- ~~Codes and~~ Applicable codes, standards ~~adopted by the authority having jurisdiction~~, and program requirements
- Building science:
    - Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- Framing ~~structures and processes~~techniques
- Door and window installation techniques (e.g., flashing, drainage plane, etc.)
- Door and window types
- Door and window components
- Door and window glazing

- ~~Window types.~~
- Mobile/manufactured homes window and door construction, components, hardware, and nomenclature
- U.S. Environmental Protection Agency, DOE, and OSHA requirements (e.g., asbestos, lead).

5.3.10 D3-Task 10: ~~Use~~Conduct energy ~~modeling software.~~analysis

Ability to:

- Determine pertinent ~~modeling~~input data
- Analyze the output from the energy analysis (e.g., modeling software, spreadsheets, etc.)
- Produce ~~a cost and~~an energy savings report~~.~~
- Determine the economics of recommended measures (e.g., savings-to-investment ratio, return on investment, etc.).

Knowledge of:

- Basic construction ~~terms~~terminology and components
- Building science:
    - Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- Energy modeling ~~software~~ principles~~.~~
- Energy-saving calculations
- How to determine cost estimates.

5.3.11 D3-Task 11: Generate the recommended work scope~~.~~

Ability to:

- ~~Determine the recommended~~ Specify health and safety measures
- ~~Determine the recommended~~Specify building durability measures
- ~~Determine the recommended~~Specify energy conservation measures
- ~~Determine the economics of recommended~~Specify measures that address occupant concerns (e.g., ~~savings to investment ratio [SIR], return on investment [ROI])~~comfort, carbon footprint, etc.)
- ~~Anticipate~~Specify incidental/related repairs
- Determine potential health and safety impacts or consequences from the recommended ~~retrofit~~ measures
- Specify materials, quantities, and labor hours to install measures
- Specify methods and materials to ensure ~~thermal and pressure boundary~~ the integrity and ~~alignment~~durability of the measures installed
- ~~Assemble~~Determine work specifications~~.~~ (e.g., Standard Work Specifications, building code, etc.).

Knowledge of:

- Building science:
  - ~~Codes and standards adopted by the authority having jurisdiction~~
    - ~~Construction practices,~~Heat transfer mechanisms (e.g., convection, conduction, radiation)
    - Moisture transfer mechanisms (e.g., water vapor, bulk moisture)
    - Air transfer mechanisms (e.g., stack effect, pressure differences, etc.).
- General construction (e.g., techniques, ~~and~~ terminology, materials)
- General mobile/manufactured homes construction (e.g., techniques, terminology, materials)
- Energy modeling ~~software~~principles
- Energy-saving calculations
- How to determine cost estimates
- Interpretation of energy savings/modeling outputs
- Cost-benefit analysis

~~Program rules~~Leveraged funding opportunities

- Allowable measures
- Available program incentives
- Sequencing of work best practices
- Effects of change orders on cost-effectiveness
- Estimating labor hours and ~~standards~~materials.
  - ~~Funding or financing mechanisms for energy-efficiency upgrades. Skill in:~~
    - ~~Cost estimating.~~