ENERGY EFFICIENCY TECHNICIAN

APPENDIX A

O*NET CODE 47-4011.01

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

Approximate Hours

A. Energy Basics: Tools, Instruments, Materials **150**

1. Familiarization with contents of energy auditor's tool kit
2. Care and proper use of diagnostic tools and instruments
3. Familiarization with different types of energy conservation materials, such as: caulk, expanding foam, cellulose, etc. (no installation)
4. Understanding different fuel types, their units of measurement, and BTU's
5. Performing utility bill history analysis; comparing the building to a benchmark; establishing separation between base load and weather-dependent fuel usage; identifying peak demand savings opportunities; identifying anomalies
6. Understanding different energy market players (utilities and other energy suppliers) and most basic rate structures

B. Interviewing Client **150**

1. Presenting oneself in a pleasant, professional manner
2. Establishing rapport and explaining benefits of audit and energy conservation
3. Interviewing client to obtain detailed information about their energy use and needs (heat, light, hot water, appliances, etc.)
4. Determining areas of client complaints/concerns

C. Inspecting Client's Home **1,000**

1. Following safety precautions when working around chemical, biological, and other potential hazards; following isolation procedures for household pollutants
2. Recognizing contributing factors to comfort problems

3. Demonstrating proper applications and use of temperature measuring devices
4. Using pressure pan and conducting room-to-room pressure diagnostics
5. Blower door setup; accurate measurement and interpretation of results; applying measured air leakage test results
6. Inspecting fit of windows and doors
7. Determining appropriate method for assessing wall insulation levels; checking adequacy of wall and ceiling insulation
8. Demonstrating an understanding of the hazards associated with knob & tube wiring; determining if it is live using basic electrical inspection techniques
9. Applying appropriate strategies for alignment of insulation and air barrier
10. Conducting duct leakage testing (total leakage and leaking to the outside): setup, accurate measurement, and interpretation of results
11. Inspecting insulation on piping and ductwork
12. Determining hot water tank heat-loss rating to determine possible need for tank insulation blanket
13. Examining furnace air filter and heat exchanger
14. Examining heating distribution for balancing needs/opportunities (no actual performance of testing-and-balancing work)
15. Demonstrating awareness of higher-efficiency heating system for possible replacement
16. Verifying installed airflow rates of ventilation devices
17. Demonstrating knowledge of minimum ventilation rates; applying blower door test results and Building Tightness Level (minimum ventilation requirements) in development of improvement strategies
18. Checking attic ventilation and compliance with local code for attic vents (where applicable and appropriate)
19. Inspecting for areas containing moisture or bulk water in undesirable locations
20. Identifying vapor barriers (where applicable and appropriate)
21. Calculating R values (where applicable and appropriate)

22. Checking home appliances for age and efficiency; checking appliances and combustion appliances for proper venting
23. Using proper methods for identifying/testing fuel leaks
24. Evaluating ambient carbon monoxide (CO)
25. Performing steady-state efficiency tests on combustion appliances
26. Performing carbon monoxide (CO) testing of combustion appliances
27. Performing health and safety tests of heating equipment, including: combustion zone, CO, and draft tests; using combustion analysis and safety testing results to develop appropriate recommendations
28. Looking for system optimization opportunities via: sizing, controls, set-back thermostats, operating strategies, and proper application
29. Inspecting for basic electrical safety – e.g., frayed wires, open boxes, etc.
30. Identifying opportunities for potential renewable energy applications: geothermal, photovoltaic, wind
31. Understanding/recognizing need for referring to a diagnostic specialist for further investigation as appropriate
32. Demonstrating knowledge regarding differentiating between perceived vs. real savings opportunities

D. Making Recommendations to Client **300**

1. Presenting options for comprehensive conservation strategies that are consistent with sound building science practices
2. Advising client on how to operate appliances and equipment most efficiently; discussing opportunities for/ advantages of Energy Star lighting and appliances
3. Advising client on desirable maintenance procedures and schedules
4. Advising client on water conservation devices and strategies; discussing domestic hot water conservation strategies
5. Recommending specific improvements such as: adding weatherstripping, installing insulation, modifying/replacing windows, duct sealing.

6. Specifying appropriate materials and processes needed for building performance projects
7. Providing appropriate cost-benefit analysis guidance; educating client about life-cycle costing
8. Providing client with rough estimates of costs of improvements and possible sources of financing
9. Using modeling software tool to perform energy analysis
10. Summarizing results of analysis and recommendations in reports

E. Quality Control **200**

1. Re-visiting client's home, after major recommended improvements have been made, to inspect completed work
2. Working with contractor(s) to correct any deficiencies
3. Demonstrating knowledge of difference between construction management and post inspection
4. Preparing and transmitting punchlist

F. Documentation **200**

1. Keeping accurate computerized records of interviews, inspections, recommendations, post-inspection of major improvements
2. Obtaining client's sign-off on completed work
3. Submitting paperwork to paying agency (if other than client)
4. Keeping accurate attendance records
5. Keeping accurate travel records
6. Keeping accurate record of inventory (inventory management)
7. Comparing estimates with actual costs in order to improve future estimates

Approximate Total Hours **2,000**

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to https://dol.ny.gov/public-work-and-prevailing-wage

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APPENDIX B

RELATED INSTRUCTION

Safety and Health

1. General Trade Safety, including any applicable federal/state/local requirements
2. Proper Use of Personal Protective Equipment (PPE)
3. Ladder Safety
4. Fall Protection
5. Defensive Driving
6. Material Safety Data Sheets (MSDS)
7. Asbestos Awareness – minimum 4 hours (see attachment)
8. Lead-Safe Work Practices
9. Mold Awareness
10. Carbon Monoxide Awareness
11. Precautions When Working Around Other Potential Hazards
12. First Aid – minimum 6.5 hours every 3 years
13. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

Mathematics

1. Fundamentals (including addition, subtraction, multiplication, division, fractions, decimals, percentages, ratios)
2. Trade Applications, including, but not limited to:
    a. Calculating heating degree days and cooling degree days
    b. Measurement and building calculation (including square footage and volume)
    c. Unit conversions
    d. Estimating costs of improvements
    e. Calculating building tightness levels (minimum ventilation requirements)
    f. Cost-effectiveness of energy-saving measures
    g. Calculating savings-to-investment ratios

Trade Theory and Science

1. Understanding the Role and Responsibilities of the Energy Efficiency Technician,
    a. Building Analyst Professional, and Envelope Professional
2. Fundamentals of Building Science
    a. Understanding Basic Terms and Definitions including, but not limited to:
        i. Airflow in buildings/ducts (CFM, CFM 50, CFM 25, ACHn, FPM)
        ii. Equipment efficiencies (AFUE, SSE, SEER, EER, HSPF)
        iii. Power and energy (watts, BTU/hour, ton of refrigeration, watt-hours, BTU, therm, decatherm)
    b. Effective leakage area
    c. Area weighted R-value
    d. Baseload/seasonal energy use
    e. Driving forces (including natural and mechanical): pressure, temperature, moisture differential
    f. Behavior of radiation (emissivity, reflectivity, absorptivity)
    g. Thermal resistance/transmittance (R and U values, including conversions)
    h. Latent/sensible heat (evaporation, condensation/specific heat, heat capacity)
    i. Total equivalent length
    j. Basics of dehumidification/humidification, as well as measurement equipment
    k. Pressure units and their conversion (Inches of Water Column – iwc, Pascal – Pa)
    l. Understanding and identifying thermal bridges
    m. Pressure boundary
    n. Stack effect
    o. Exfiltration and infiltration
    p. Natural/mechanical ventilation
    q. Net free area
    r. Input/output capacity

s. Peak electrical demand
t. Permeability and perm rating
u. Standby loss
v. IAQ (indoor air quality): moisture, CO, dust
w. Sones
x. Psychometrics

Principles of Energy, Air and Moisture

1. Thermodynamics: conduction; convection; radiation; change in temperature, including air movement due to temperature gradients
2. Factors that affect insulation performance: density, installation, moisture
3. House pressurization/depressurization by various forces
4. Heat gain/loss: internal, solar, heat transmission, air leakage
5. Power and energy: BTU content of fuels, capacity of combustion appliances and electrical appliances
6. Moisture transport mechanisms: bulk water, air leakage, diffusion, capillary action
7. Identifying areas of highest relative humidity
8. Principles of combustion: combustion analysis, CO

Combustion Science

1. Combustion analysis: oxygen, fuel-gas temperature, carbon monoxide
2. Basics of: combustion appliance venting, draft, and combustion air including identification of proper sizing/vent tables
3. Combustion safety issues: combustion air, draft, worst case/ baseline depressurization, spillage, backdrafting, unvented combustion appliances
4. Effect of duct leakage on depressurization of Combustion Appliance Zone (CAZ)

Building Components

1. Identifying basic duct configurations and components
2. Identifying basic hydronic distribution configurations and components

3. Identifying basic structural components of residential construction
4. Thermal boundaries and insulation applications
5. Basic electrical components and safety considerations; understanding hazards associated with knob & tube wiring
6. Basic fuel delivery systems and safety considerations
7. Basic bulk water management components (drainage, plumbing, gutters, sumps, etc.)
8. Vapor barriers/retarders
9. Radiant barrier principles and installations
10. Understanding fenestration types and efficiencies
11. Understanding issues involved with basements, crawlspaces, slabs, attics, attached garages, interstitial cavities, and bypasses
12. Understanding issues involved with ventilation equipment
13. Understanding basic heating/cooling equipment components, controls, and operation
14. Understanding basic Domestic Hot Water (DHW) equipment components, controls, and operation
15. Identifying common mechanical safety controls
16. Identifying insulation types and R-values
17. Understanding various mechanical ventilation equipment and strategies: spot, ERV, HRV
18. Identifying/understanding high density cellulose

Installation Safety and Specification

1. Understanding needs for protective shielding and baffling for the preparation of insulation installation
2. Working knowledge of air sealing techniques and materials
3. Methods for determining if dense packing procedure has reached appropriate density
4. Blown insulation: air pressure to material ratio manufacturer's recommended density to achieve the R-value

Conservation Strategies

1. Understanding the implications of building performance improvements on occupants and other building systems/components

2. Appropriate insulation applications and installation based on existing conditions; understanding importance of coordinating air sealing work with insulation work
3. Understanding importance of air leakage control and remediation procedures, including interaction with blower door-guided air sealing techniques
4. Heating and cooling efficiency applications
5. Proper use of modeling to determine heating and cooling equipment sizing and appropriate energy

Comprehensive Building Assessment Process

1. Understanding locations in which to identify indoor air quality issues
2. Recognizing need for airsealing measures and their impact on other building systems
3. Recognizing need for mechanical equipment improvements
4. Understanding blower door use for identifying critical airsealing areas
5. Equipment control strategies for maximizing occupant comfort and minimizing energy consumption
6. Understanding interaction between mechanical systems, envelope systems and occupant behavior
7. Understanding applicability, content, and intent of Building Performance Institute's National Standards
8. Recognizing need for a professional local/state/national codes evaluation

Design Considerations

1. Appropriate insulation applications based on existing conditions
2. Appropriate applications for sealed crawlspaces, basements, attics
3. Understanding fire codes as necessary to apply home-performance in a code-approved manner
4. Understanding/recognizing building locations where non-flammable materials must be used
5. Understanding/recognizing building locations where opportunities for retrofit materials and processes are needed to correct problems and/or enhance performance

6. Determining basement air sealing strategy dependent on the interpretation and application of blower door test results
7. Climate-specific concerns
8. Indoor environment considerations for the environmentally-sensitive
9. Impact of building orientation, landscape, drainage, and grading
10. Opportunities for potential renewable energy opportunities: geothermal, photovoltaic, wind
11. Impact of shading on heating/cooling loads
12. Awareness for solar gain reduction in cooling climate/solar gain opportunities in heating climates
13. Understanding need for modeling various options for heating, cooling, and DHW applications, as well as other efficiency upgrades

Applied Diagnostics and Troubleshooting

1. Identifying proper appliance and combustion appliance venting
2. Ventilation calculations and strategies
3. Proper methods for identifying/testing fuel leaks
4. Combustion Appliance Zone (CAZ): depressurization, spillage, draft, carbon monoxide (ambient and flue)
5. Recognizing contributing factors to comfort problems
6. Understanding building shell/envelope leakage as a function of pressure difference and the size of holes in the air barrier

Appliances and Lighting

1. Understanding benefits of ENERGY STAR labeled lights and appliances
2. Understanding impact on load associated with lighting and appliance retrofits

Professional Conduct and Work Ethics

1. Understanding role and basic elements of a quality management system

Building Envelope and Framing Types

Blower Door Technology and Testing

Thermal Boundary and Pressure Diagnostics

The Whole-Home Approach

Theory and Principles of Heat Generation and Distribution

Introduction to Tools and Instruments Used in the Trade

Measuring and Verifying Building Performance

Funding Sources for Making Energy Improvements

Other Workplace Skills

1. Computer Basics
2. Use of Building Benchmarking and Modeling Software
3. Written and Oral Communication Skills
4. Interviewing Skills
5. Time Management

Other Related Courses as Necessary

A minimum of 144 hours of Related Instruction is required for each apprentice for each year.

Appendix B topics are approved by New York State Education Department.

ATTACHMENT TO APPENDIX B

Asbestos Awareness

This course must be delivered by one of the following:

1. A provider currently approved by the New York State Department of Health to deliver asbestos safety training.
2. A person holding a current Asbestos Handler certificate from the New York State Department of Labor in the title of: Inspector, Supervisor, Project Monitor, Management Planner, or Project Designer.
3. Anyone otherwise approved by the New York State Education Department.

Minimum course contents must include the following:

1. Definition of asbestos
2. Types and physical characteristics
3. Uses and applications
4. Health effects:
    a. Asbestos-related diseases
    b. Risks to families
    c. Cigarette smoking
    d. Lack of safe exposure level
5. Employer-specific procedures to follow in case of potential exposure, including making a supervisor or building owner immediately aware of any suspected incidental asbestos disturbance so that proper containment and abatement procedures can be initiated promptly.

Notwithstanding the above course requirement, employers are advised that they must also be in compliance with New York State Department of Labor Industrial Code Rule 56 at all times.

Employers are further advised, and must advise all apprentices, that completion of the above course requirement does not authorize any person to remove, encapsulate, enclose, repair, disturb, or abate in any manner, any friable or non-friable asbestos, asbestos containing material, presumed asbestos containing material, or suspect miscellaneous asbestos containing material.