ENERGY EFFICIENCY PROGRAMS

Health and Safety Field Guide

Standard Work Specifications for Single-Family Homes

7.9.18

This document is intended to summarize best practices and published guidance for residential contractors and home performance professionals' safe and effective completion of work within Ameren Illinois Energy Efficiency Programs. It references the National Renewable Energy Laboratory's Standard Work Specifications Tool:

Guidelines for Home Energy Professionals: Standard Work Specifications for Single-Family Home Energy Upgrades. U.S. Department of Energy Weatherization Assistance Program/National Renewable Energy Laboratory. http://sws.nrel.gov, accessed 12/14/2017.

This document is provided for the convenience of participating Ameren Illinois Program Allies and Energy Advisors, and does not replace or surmount similar guidelines published by the Building Performance Institute, Air Conditioning Contractors of America, ENERGY STAR, or other agencies or associations with whom contractors and professionals may hold certifications or credentials. Users of this document are encouraged to review and reference these or other vetted installation standards for further information or detail prior to the start of work.

2 Health and Safety

2.1 Safe Work Practices

2.1.1 Safe Work Practices General

2.1.1.1 - Global Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.1.1.1 - Prevention through design

Specification(s):

Design will be incorporated to eliminate or minimize hazards (e.g., material selection, access to equipment for installation and maintenance, placement of equipment, ductwork and condensate lines)

Objective(s):

Prevent worker injuries

Reduce risk exposure to toxic substances and physical hazards

2.1.1.1.2 - Hand protection

Specification(s):

Durable and wrist-protecting gloves will be worn that can withstand work activity

Objective(s):

Minimize skin contact with contaminants

Protect hands from hazards

2.1.1.1.3 - Respiratory protection

Specification(s):

If the risk of airborne contaminants cannot be prevented, proper respiratory protection will be provided and worn (e.g., N-95 or equivalent face mask)

When applying low pressure 2-component spray polyurethane foam (SPF), air purifying masks with an organic vapor cartridge and P-100 particulate filter will be used

When applying high-pressure SPF insulation, supplied air respirators (SARs) will be used

Consult Safety Data Sheet (SDS) for respiratory protection requirements

OSHA 1910.134 shall be followed for the implementation of a respiratory protection program

Objective(s):

Minimize exposure to airborne contaminants (e.g., insulation materials, mold spores, feces, bacteria, chemicals)

2.1.1.1.4 - Electrical safety

Specification(s):

An electrical safety assessment will be performed

All electric tools will be protected by ground-fault circuit interrupters (GFCI)

Three-wire type extension cords will be used with portable electric tools

Worn or frayed electrical cords will not be used

Water sources (e.g., condensate pans) and electrical sources will be kept separate

Metal ladders will be avoided

Special precautions will be taken if knob and tube wiring is present

Aluminum foil products will be kept away from live wires

For arc flash hazards, NFPA 70E will be consulted

Objective(s):

Avoid electrical shock and arc flash hazards

2.1.1.1.5 - Carbon monoxide (CO)

Specification(s):

All homes will have a carbon monoxide (CO) alarm recommended if a functional unit is not present.

Ambient CO will be monitored during combustion testing and testing will be discontinued if ambient CO level inside the home or work space exceeds 70 parts per million (ppm)

Objective(s):

Protect worker and occupant health

2.1.1.1.6 - Personal Protective Equipment

Specification(s):

Safety Data Sheets (SDS) and OSHA regulations will be consulted for equipment and protective clothing would be worn if contaminants are present (e.g., insulation materials)

Eye protection will always be worn (e.g., safety glasses, goggles if not using full-face respirator)

Objective(s):

Protect worker from skin contact with contaminants

Minimize spread of contaminants

Provide eye protection

2.1.1.1.7 - Confined space safety

Specification(s):

Spaces with limited ingress and egress and restricted work area will be considered confined space

Access and egress points will be located before beginning work

Inspection will be conducted for hazards, such as damaged or exposed electrical conductors, mold, sewage effluent, friable asbestos or fiberglass, pests, and other potential hazards

Adequate ventilation will be provided

Use of toxic material will be reduced

Objective(s):

Prevent build-up of toxic or flammable contaminants

Reduce risk to the workers in the confined space

Provide adequate access and egress points

Prevent electrical shock

2.1.1.1.8 - Power tool safety

Specification(s):

Power tools will be inspected and used in accordance with manufacturer specifications and OSHA regulations to eliminate hazards such as those associated with missing ground prongs, ungrounded circuits, misuse of power tools, noise, and improper or defective cords or extension cords. All tools must be maintained in proper operating condition with all guards securely in place

All devices used will be verified as ground-fault circuit interrupters (GFCI) protected or double insulated

Exhaust gases from compressors and generators will be prevented from entering interior space

Objective(s):

Prevent power tool injuries

Prevent buildup of toxic or flammable contaminants

2.1.1.1.9 - Chemical safety

Specification(s):

Hazardous materials will be handled in accordance with manufacturer specifications, Safety Data Sheets (SDS) and OSHA standards to eliminate hazards associated with volatile organic compounds (VOCs), sealants, insulation, contaminated drywall, dust, foams, asbestos, lead, mercury, and fibers

Appropriate personal protective equipment (PPE) will be provided

Workers will be trained on how to use PPE

Workers will be expected to always use appropriate PPE during work

Objective(s):

Prevent worker exposure to toxic substances

2.1.1.1.10 - Ergonomic safety

Specification(s):

Appropriate personal protective equipment (PPE) will be used (e.g., knee pads, bump caps, additional padding)

Proper equipment will be used for work

Proper lifting techniques will be used

Objective(s):

Prevent injuries from awkward postures, repetitive motions, and improper lifting

2.1.1.1.11 - Hand tool safety

Specification(s):

Hand tools will be maintained in safe working order and used for intended purpose

Objective(s):

Prevent injuries

2.1.1.1.12 - Slips, trips, and falls

Specification(s):

Caution will be used around power cords, hoses, tarps, and plastic sheeting

Precautions will be taken when ladders are used, when working at heights, or when balancing on joists

Walk boards will be used when practical

When scaffolding is used, manufacturer set-up procedures will be followed

Appropriate footwear and clothing will be worn

Objective(s):

Prevent injuries due to slips, trips, and falls

2.1.1.1.13 - Thermal stress

Specification(s):

Ensure staff is aware of risks during extreme weather including the symptoms of heat stroke, heat exhaustion, and hypothermia

Appropriate ventilation, hydration, rest breaks, and cooling equipment will be provided

911 will be dialed when necessary

Objective(s):

Prevent heat stroke, heat stress, and cold stress related injuries

2.1.1.1.14 - Fire safety

Specification(s):

Ignition sources will be identified and eliminated (e.g., turn off pilot lights and fuel supply)

Use of flammable material will be reduced and fire-rated materials will be used

Objective(s):

Prevent a fire hazard

2.1.1.1.15 - Asbestos-containing materials (ACM)

Specification(s):

Assess potential asbestos hazard; if unsure whether material contains asbestos, contact a qualified asbestos professional to assess the material and to sample and test as needed

If suspected ACM is in good condition, do not disturb

If suspected ACM is damaged (e.g., unraveling, frayed, breaking apart), immediately isolate the area(s)

For suspected ACM that is damaged or that must be disturbed as part of the retrofit activity, contact an asbestos professional for abatement or repair in accordance with federal, state, and local requirements; only a licensed or trained professional may abate, repair, or remove ACM

When working around ACM, do not:

- Dust, sweep, or vacuum ACM debris
- Saw, sand, scrape, or drill holes in the material
- Use abrasive pads or brushes to strip materials

Asbestos abatement or repair work shall be completed prior to blower door testing

Objective(s):

Protect workers and occupants from potential asbestos hazards

2.1.1.1.16 - Lead paint assessment

Specification(s):

Presence of lead based paint in pre-1978 homes will be assumed unless testing confirms otherwise

The Environmental Protection Agency (EPA) Renovation, Repair, and Painting (RRP) Program Rule (40 CFR Part 745) in pre-1978 homes and proposed changes to this rule (Federal Register/Vol. 75, No. 87/May 6, 2010) will be complied with, to be superseded by any subsequent final rulemaking or any more stringent state or federal standards

Objective(s):

Protect workers and occupants from potential lead hazards

2.1.1.1.17 - Site security

Specification(s):

Work site will be secured to prevent unauthorized entry

Temporarily disconnected equipment will be locked up and tagged out

All loose or un-bagged trash and unused materials will be removed from work site daily

Objective(s):

Protect the occupant from exposure to potential hazards

2.1.1.1.18 - Crawl space safety

Specification(s):

The source of all contaminants (e.g., sewage, dead animals, needles) will be corrected, repaired, or removed before performing inspections that require complete access to the crawl space

If appropriate, the contaminant will be neutralized and/or a protective barrier will be installed in the area

Objective(s):

Ensure work safety

Prevent worker exposure to hazards

2.1.1.2 - Work Area Inspection and Stabilization

Desired Outcome:

Provide a safe and stable work environment that will support and sustain work to be performed

2.1.1.2.1 - Inspect to confirm integrity of existing building assembly

Specifications:

An inspection will be conducted for existing conditions that may hinder successful installation of proposed energy improvement

Objective(s):

Ensure the work area and associated building assemblies are suitable for the proposed work

2.1.1.2.2 - Identify hazardous construction materials that may be disturbed or compromised by proposed work

Specifications:

The inspection will include determination of the presence of known or presumed hazardous construction materials, including lead paint, asbestos, and in the case of window replacement, caulk, which may contain polychlorinated biphenyls

Where proposed work can be performed without disturbing suspect materials or under conditions consistent with applicable codes and regulations, a presumption of the presence of hazardous construction materials may be made without actual testing where such testing is not an integral part of the work to be performed

Objective(s):

Ensure known or presumed hazardous materials are treated in a manner consistent with all codes and regulations

2.1.1.2.3 - Identify environmental conditions that may create or worsen unsafe or unstable building assembly conditions

Specifications:

The inspection will include determination of the presence of adverse environmental conditions, including excess moisture in contact with building assemblies, mold, wood-decaying fungi, and rodent or insect infestation

A visual inspection of exposed electrical wires, junction boxes, and related equipment will be made to identify any unsafe conditions

Where insulation materials will be delivered into closed cavities, evaluation of wiring types within such cavities will be conducted to determine if proposed insulation application is compatible with current performance characteristics of wiring (e.g., wiring types that present a fire hazard when in close contact with insulation materials, wiring types subject to corrosion when in contact with certain types of insulation or which may be adversely affected by heat, moisture, or process conditions associated with the installation of certain insulation types)

Objective(s):

Ensure adverse environmental conditions do not compromise the stability or longevity of proposed work

Ensure the integrity and soundness of building assemblies

Preserve the safety and integrity of existing building assemblies and materials after installation of proposed improvements

2.1.1.2.4 - Address and correct hazardous or adverse conditions

Specifications:

Where excess moisture conditions are identified where their correction is not included in proposed work, such conditions will be corrected before work begins

Where building assemblies or components are found to have been damaged or destroyed, such assemblies will be restored before or during proposed work

Where indications of rodent infestation are identified, air sealing materials will incorporate anti-gnawing measure (e.g., copper wool in-fill, metal sheeting)

When pests have been identified, follow integrated pest management practices to seal holes with pest proof materials (corrosion proof materials)

Objective(s):

Ensure the safety and durability of the associated structures

Ensure proposed work will not cause or perpetuate unsafe or unhealthy building conditions

2.1.2 Air Sealing

2.1.2.1 - Air Sealing Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.2.1.1 - Worker safety

Specification(s):

Worker safety specifications will be in accordance with *2.1.1.1 Global Worker Safety*; an action plan based on hazard; plan will be in place for each job site

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.2.1.2 - Moisture precautions for crawl spaces and basements

Specification(s):

Exposed earth will be covered with a continuous, durable, and sealed class I vapor retarder that is suitable for ground contact exposure to normal service traffic

Causes of air dew points greater than 55°F will be identified and eliminated in crawl spaces connected to conditioned spaces

Seasonal dehumidification (e.g., dehumidified or conditioned with air conditioner supply) will be recommended where humidity sources, including outdoor air incursion, cannot be eliminated

Un-designed penetrations between the crawl space or basement and the outdoors will be sealed

Holes between the crawl space or basement and the living space will be sealed

Open sumps and intentional slab or vapor barrier penetrations will be sealed or capped to control moisture and radon levels

Objective(s):

Ensure durability of repairs

Reduce potential for occupant exposure to mold and other moisture-related hazards

Reduce potential for occupant exposure to radon and other soil gases

2.1.2.1.3 - Moisture precautions: living space

Specification(s):

Moisture sources in the building will be identified and reduced or removed

Where local ventilation will be installed, (e.g., baths, kitchens), exhaust units will be vented to the outdoors in accordance with ASHRAE 62.2-2013

Unvented heaters will be removed except when used as a secondary heat source and when it can be confirmed that the unit is listed to ANSI Z21.11.2

Unvented gas or propane cooking stoves will be tested for carbon monoxide (CO) per ANSI/BPI-1200-S-2015 and corrected as required before air sealing work begins

If replacing air conditioning system, new system will be sized to optimize dehumidification

Properly sized dehumidifier will be installed to satisfy latent and sensible loads, when necessary

ANSI/ACCA 2 Manual J-2011 (Residential Load Calculation) will be used to size replacement AC and heat pumps

Enhanced dehumidification will be installed in the Gulf Coast region areas on the Gulf side of the warm humid line on the International Energy Conservation Code map

Objective(s):

Ensure durability of building components and repairs

Reduce potential for occupant exposure to mold and other moisture-related hazards

Reduce potential occupant exposure to CO

2.1.2.1.4 - Moisture precautions for exterior water

Specification(s):

Before air sealing and insulating building components, exterior water management will be addressed

Before insulating basement or crawl space walls near wet areas, surface water pooling near the foundation will be addressed by repairing, modifying, or replacing gutters and downspouts

Grading and subsurface drainage at critical locations (e.g., localized drain and grading beneath valleys) will be in accordance with EPA Indoor airPLUS Construction Specifications Section 1.1

Objective(s):

Reduce potential for occupant exposure to mold and other moisture-related hazards

2.1.3 Insulation

2.1.3.1 - Insulation Worker Safety

Desired Outcome:

Work is completed safely without injury or hazardous exposure

2.1.3.1.1 - Worker safety

Specification(s):

Worker safety specifications will be followed in accordance with section *2.1.1.1 Global Worker Safety*

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.3.1.2 - Asbestos containing materials (ACM)

Specification(s):

OSHA asbestos abatement protocol 29 CFR 1926.1101 will be followed if vermiculite insulation is present

Assess potential asbestos hazard; if unsure whether material contains asbestos, contact a qualified asbestos professional to assess the material, and to sample and test as needed

If suspected ACM is in good condition, do not disturb

If suspected ACM is damaged (e.g., unraveling, frayed, breaking apart), immediately isolate the area(s)

For suspected ACM that is damaged or that must be disturbed as part of the retrofit activity, contact an asbestos professional for abatement or repair, in accordance with federal, state, and local requirements; only a licensed or trained professional may abate, repair, or remove ACM

When working around ACM, do not:

Dust, sweep, or vacuum ACM debris

Saw, sand, scrape, or drill holes in the material

Use abrasive pads or brushes to strip materials

Asbestos abatement or repair work shall be completed prior to blower door testing

Objective(s):

Protect workers and occupants from potential asbestos hazards

2.1.3.1.3 - Materials

Specification(s):

All materials will be handled in accordance with manufacturer specifications or safety data sheets (SDS) standards

Objective(s):

Eliminate hazards associated with incorrect, defective, or improperly used or installed materials

2.1.3.1.4 - Lead paint assessment

Specification(s):

Presence of lead based paint in pre-1978 homes will be assumed unless testing confirms otherwise

The Environmental Protection Agency (EPA) Renovation, Repair, and Painting (RRP) Program Rule (40 CFR Part 745) in pre-1978 homes and proposed changes to this rule (Federal Register/Vol. 75, No. 87/May 6, 2010) will be complied with, to be superseded by any subsequent final rule making or any more stringent state or federal standards

Objective(s):

Protect worker and occupant from potential lead hazards

2.1.4 Heating and Cooling Equipment

2.1.4.1 - Combustion Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.4.1.1 - Worker safety

Specification(s):

All worker safety specifications in section *2.1.1.1 Global Worker Safety* will be followed

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.4.1.2 - Carbon monoxide (CO)

Specification(s):

Ambient CO will be monitored during combustion testing and testing will be discontinued if ambient CO level inside the home or work space reaches or exceeds 70 parts per million (ppm)

Objective(s):

Protect worker and occupant health

2.1.4.1.3 - Raw fuel

Specification(s):

Raw fuel leaks will be monitored for before entering building spaces

If leaks are found, testing will be discontinued and condition reported to occupant immediately

Objective(s):

Protect worker and occupant health

2.1.4.2 - Heating and Cooling Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.4.2.1 - Worker safety

Specification(s):

Follow all worker safety specifications in section *2.1.1.1 Global Worker Safety*

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.4.2.2 - Mercury

Specification(s):

When replacing existing thermostats, identify and dispose of any mercury containing thermostats in accordance with Environmental Protection Agency (EPA) guidance

Objective(s):

Protect worker and occupant from mercury exposure

2.1.4.2.3 - Asbestos

Specification(s):

Suspected asbestos hazards will be identified in furnaces (e.g., gaskets), wood stoves, zonal heating devices, electrical wiring insulation, boilers, and pipe insulation and corrected in accordance with EPA guidance

Workers will take precautionary measures to avoid exposure

Objective(s):

Protect worker and occupant from asbestos exposure

2.1.4.2.4 - Personal protective equipment (PPE)

Specification(s):

Workers will wear personal protective equipment (PPE) as needed to protect themselves against exposure to hazards (e.g., pests, sewage, flooded duct work, mold, chemicals, scat, and viruses)

Long sleeves and long pants should be worn as additional protection from liquid nitrogen and other hazardous materials

Objective(s):

Protect worker from exposure to hazards

Protect worker from skin contact with liquid nitrogen

2.1.4.2.5 - Combustible gas detection

Specification(s):

Worker will check for presence of combustible gas leaks before work begins

Leaks will be repaired before work is performed

Objective(s):

Protect worker and occupant from exposure to hazards

2.1.4.2.6 - Carbon monoxide (CO)

Specification(s):

Workers will check for presence of ambient CO before and during work

CO issues will be addressed before work is performed or continued

Objective(s):

Protect worker and occupant from exposure to hazards

2.1.4.2.7 - Sealant

Specification(s):

Pipes will be sealed by a certified professional with an approved fastening process and sealant in accordance with manufacturer specifications (International Fuel Gas Code)

Gas lines will be leak free when tested with an electronic combustible gas leak detector

OR

Gas lines will be leak free when tested by a standing pressure test that meets the approval of the local code

Objective(s):

Install gas lines with no leaks

2.1.4.2.8 - Safety devices

Specification(s):

A secondary LP safety detector system (valve, exhaust fan, alarm light) will be installed by a certified professional for propane piping installed below grade

When installing new equipment, a shut off valves will be installed by a certified professional at each gas appliance (ANSI Z21.15)

Objective(s):

Detect accumulation of dangerous levels of propane in below-grade areas

Isolate appliances from the rest of the system for emergencies, removal, or repairs

2.1.5 Ventilation Equipment

2.1.5.1 - Ventilation Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.5.1.1 - Worker safety

Specification(s):

Follow all worker safety specifications in section *2.1.1.1 Global Worker Safety*

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.6 Material Safety

2.1.6.1 - Material Selection, Labeling, and Safety Data Sheets (SDSs)

Desired Outcome:

Occupant and worker risk from hazardous materials minimized

2.1.6.1.1 - Material selection

Specification(s):

Materials that do not create long-term health risks for occupants and workers will be used

Objective(s):

Improve indoor air quality in the living space

2.1.6.1.2 - Material labels

Specification(s):

Manufacturer specifications will be followed

Objective(s):

Reduce risk of exposure to harmful substances

Follow safety procedures

2.1.6.1.3 - Safety Data Sheets (SDSs)

Specification(s):

SDSs will be provided onsite and available during all work

Objective(s):

Assess exposure risk

Prepare a response in case of emergency

2.1.7 Basements and Crawl Spaces

2.1.7.1 - Basements and Crawl Spaces Worker Safety

Desired Outcome:

Work completed safely without injury or hazardous exposure

2.1.7.1.1 - Worker safety

Specification(s):

All worker safety specifications in section *2.1.1.1 Global Worker Safety* will be followed

Objective(s):

Prevent injury

Minimize exposure to health and safety hazards

2.1.7.2 - Basements and Crawl Spaces—Pre-Work Qualifications

Desired Outcome:

Site properly prepared for upgrade

2.1.7.2.1 - Fuel leaks

Specification(s):

Fuel leaks will be repaired and inspected in accordance with the IRC

Objective(s):

Ensure site is safe and ready for upgrade

2.1.7.2.2 - Electrical hazards

Specification(s):

Electrical hazards will be eliminated and inspected in accordance with NFPA 70 National Electric Code

Objective(s):

Ensure site is safe and ready for upgrade

2.1.7.2.3 - Mold

Specification(s):

Appropriate remediation will be completed before upgrade

Objective(s):

Ensure site is safe and ready for upgrade

2.1.7.2.4 - Plumbing and water leaks

Specification(s):

Plumbing leaks will be repaired before crawl space upgrade in accordance with the IRC

Objective(s):

Prepare site for upgrade

2.1.7.2.5 - Pest and termite work

Specification(s):

Pest and termite treatment will be completed before crawl space upgrade and inspected in accordance with the IRC

Objective(s):

Prepare site for upgrade

2.1.7.2.6 - Structural repairs, modifications

Specification(s):

Structural repairs and modifications will be inspected and completed before crawl space upgrade in accordance with the IRC

Objective(s):

Prepare site for upgrade

2.1.7.2.7 - Appliance and heating, ventilation, and air conditioning (HVAC) system repairs and change outs

Specification(s):

Crawl space upgrades (e.g., sealing and insulation) are to be undertaken after appliance and HVAC system

work has been completed and inspected

Objective(s):

Prepare site for upgrade

2.1.7.2.8 - Correctable standing water

Specification(s):

Passive drains or sump pumps will be used to remove standing water

Objective(s):

Prepare site for upgrade

2.1.7.2.9 - Non-correctable standing water

Specification(s):

Spaces with non-correctable standing water will not be considered for a closed crawl space

Objective(s):

Prevent possible damage to house

2.1.7.3 - Basements and Crawl Spaces—Debris Removal

Desired Outcome:

Clean, safe, and easily accessible crawl space created

2.1.7.3.1 - Debris removal

Specification(s):

Under-floor grade will be removed of all vegetation and organic material

Debris that can cause injury or puncture ground covers (e.g., nails, glass, sheet metal screws, etc.) will be removed from the crawl space

Objective(s):

Minimize punctures in ground liner

Minimize habitat for pests (Integrated Pest Management—IPM) and contaminant sources

2.1.7.3.2 - Debris disposal

Specification(s):

Debris will be properly disposed of according to type and jurisdiction

Objective(s):

Protect environment from damage

2.1.7.4 - Negative Pressure Contamination Control

Desired Outcome:

Contaminants prevented from entering house during work process

2.1.7.4.1 - Pressure

Specification(s):

A negative pressure should be maintained in the crawl space with reference to the house while work is being performed in the crawl space

Objective(s):

Prevent contaminants from entering house

2.2 Combustion Safety

2.2.1 Combustion Safety General

2.2.1.1 - Combustion Appliance Zone (CAZ) Testing

Desired Outcome:

Accurate information about appliance safe operation is gathered

2.2.1.1.1 - Assessment

Specification(s):

Emergency problems (e.g., ambient gas levels greater than 10% Lower Explosion Limit (LEL), ambient CO levels that exceed 70 ppm) will be communicated clearly and immediately to the customer, the home shall be evacuated, and appropriate personnel (e.g.: HVAC technician, utility, emergency services) shall be contacted. ;

Significant problems (e.g., gas leak less than 10% LEL, ambient CO levels that exceed 35 ppm but less than 70 ppm) will be communicated clearly and immediately to the customer and appropriate solutions will be suggested

Examine appliance for signs of damage, misuse, improper repairs, and lack of maintenance

Objective(s):

Ensure system does not have potentially fatal problems

2.2.1.1.2 - Fuel leak detection

Specification(s):

Inspect and test for gas or oil leakage at connections of natural gas, propane piping, or oil systems

If leaks are found, immediate action will be taken to notify occupant to help ensure leaks are repaired and:

- If the fuel is Ameren Illinois natural gas, the Energy Efficiency Residential Assessment Procedure located in Appendix A of this document will be followed
- If the fuel is not Ameren Illinois natural gas, BPI 1200 will be followed

The report will specify repair for leaks and replacement for hazardous or damaged gas or oil connectors and pipes

Objective(s):

Detect fuel gas leaks

Determine and report need for repair

Follow Ameren Illinois desired procedure for supplied Ameren Illinois natural gas

2.2.1.1.3 - Venting

Specification(s):

For oil systems that require a draft regulator, the presence and operability of it (that draft regulator) will be verified and tested

Combustion venting systems will be inspected for damage, leaks, disconnections, inadequate slope, and other safety hazards

Objective(s):

Determine if a regulator is present and working

Determine whether vent system is in good condition and installed properly

2.2.1.1.4 - Base pressure test

Specification(s):

Baseline pressure for naturally drafting vented appliances will be measured in Combustion Appliance Zone with reference to outdoors

Objective(s):

Measure pressure difference between combustion zone and the outside under natural conditions

2.2.1.1.5 - Depressurization test

Specification(s):

CAZ depressurization testing will be administered for all atmospherically vented appliances located inside the pressure boundary.

Depressurization test will include exhaust fans, interior door closure, or duct leakage, or a combination thereof; the test will be done to determine the largest negative pressure per ANSI/BPI-1200-S-2015 Standard.

Objective(s):

Determine worst-case depressurization in combustion zone due mechanical system fans

2.2.1.2 - Combustion Safety - Make-up Air

Desired Outcome:

Buildup of dangerous combustion byproducts in the living space prevented

Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

2.2.1.2.1 - Outside combustion make-up air

Specification(s):

Where applicable, combustion air will be provided from the outside and installed in accordance with the IRC for the type of appliance installed

Objective(s):

Prevent combustion byproducts from entering the house

2.2.1.2.2 - New appliances

Specification(s):

If replacing appliances, a sealed-combustion, direct-vent appliance will be installed if possible. New appliances will be installed in accordance with manufacturer specifications, the IRC and additional applicable codes

Objective(s):

Prevent combustion byproducts from entering the house

2.2.1.2.3 – Carbon Monoxide (CO) detection and warning equipment

Specification(s):

CO detection or warning equipment shall be recommended for installation outside of each separate sleeping area in the immediate vicinity of the bedrooms in accordance with ASHRAE 62.2-2013 and authority having local jurisdiction

Installation will be accomplished by a licensed electrician when required by local code

Objective(s):

Alert occupant to CO exposure

2.2.1.2.4 - Gas ovens

Specification(s):

Gas ovens will be tested for CO

A clean and tune will be conducted if measured CO in the undiluted flue gases of the oven vent at steady state exceeds 225 ppm as measured

Objective(s):

Ensure clean burn of gas ovens

2.2.1.2.5 - Gas range burners

Specification(s):

Specify clean and tune if the flame has any discoloration, flame impingement, an irregular pattern, or if burners are visibly dirty, corroded, or bent

Objective(s):

Ensure clean burn and operation of gas range burners

2.2.2 Unvented Space Heaters

2.2.2.1 - Unvented Space Heaters: Propane, Natural Gas,and Kerosene Heaters

Desired Outcome:

Elimination of combustion byproducts

2.2.2.1.1 - Removal

Specification(s):

With the occupant's permission, unvented heaters will be removed except when used as a secondary heat source and when it can be confirmed that the unit is listed to ANSI Z21.11.2

Units that are not being operated in compliance with ANSI Z21.11.2 should be removed before the retrofit but may remain until a replacement heating system is in place

Failure to remove unvented space heaters serving as primary heat sources has the potential to create hazardous conditions and thus any further weatherization services will be re-evaluated in the context of potential indoor air quality risks

Objective(s):

Eliminate sources of combustion byproduct within a living space

2.2.2.1.2 - Occupant education

Specification(s):

Occupant will be educated on potential hazards of unvented combustion appliances (primary or secondary) within a living space

Objective(s):

Inform occupant about possible hazards associated with combustion byproducts and moisture

2.2.3 Vented Gas Appliances

2.2.3.1 – Vented Gas Appliances

Desired Outcome:

Sufficient air provided in the Combustion Appliance Zone (CAZ)

2.2.3.1.1 - Required combustion air

Specification(s):

The required volume of indoor air will be determined in accordance with IRC and authority having jurisdiction, except that where the air infiltration rate is known to be less than 0.40 air changes per hour (ACH), IRC will be used

Exception: Existing appliances that have passed combustion safety testing per ANSI/BPI-1200-S-2015 Standard are deemed to have sufficient combustion air

Objective(s):

Determine if existing conditions meet the combustion air calculation

2.2.3.1.2 - Additional combustion air (if action is required)

Specification(s):

Additional combustion air will be provided in accordance with IRC and authority having jurisdiction when necessary to solve spillage problems

Objective(s):

Ensure adequate combustion air for operation of the appliance

2.2.3.1.3 - Spillage testing

Specification(s):

If spillage in a combustion appliance with a warm vent exceeds two minutes during pressure testing, specify measures to mitigate

If spillage in a combustion appliance with a cold vent exceeds five minutes during pressure testing, specify measures to mitigate

Objective(s):

Detect excessive spillage of combustion gases

2.2.3.2 - Combustion Flue Gas—Orphaned Water Heaters

Desired Outcome:

Flue gasses successfully removed from the house

2.2.3.2.1 - Spillage testing

Specification(s):

If spillage in a combustion appliance with a warm vent exceeds two minutes during pressure testing, specify measures to mitigate

If spillage in a combustion appliance with a cold vent exceeds five minutes during pressure testing, specify measures to mitigate

Objective(s):

Detect excessive spillage of combustion gases

2.2.3.2.2 - Flue gas removal (chimney liner or approved methods)

Specification(s):

A chimney liner will be installed in accordance with the IRC or applicable NFPA standard

Objective(s):

Allow water heater to vent properly

Prevent damage to the chimney

2.2.3.2.3 - Retesting spillage

Specification(s):

If a combustion appliance spillage exceeds two minutes during pressure testing, specify measures to mitigate

Objective(s):

Ensure appliance is not spilling longer than two minutes with a warm vent

2.2.3.2.4 - Required combustion air

Specification(s):

The minimum required volume will be 50 cubic feet per 1,000 Btu /h in accordance with IRC and authority having jurisdiction.

Exception: Existing appliances that have passed combustion safety testing per ANSI/BPI-1200-S-2015 Standard are deemed to have sufficient combustion air.

Objective(s):

Determine if existing conditions meet the combustion air calculation

2.2.3.2.5 - Additional combustion air (if action is required)

Specification(s):

Additional combustion air will be provided in accordance with IRC or other authority having jurisdiction

Objective(s):

Ensure adequate combustion air for operation of the appliance

2.2.3.3 - Occupant Education

Desired Outcome:

Ensure persistence of resident safety

2.2.3.3.1 - Occupant health and safety

Specification(s):

All homes shall have the recommendation for a functioning CO alarm if one is not present or is currently non-operable

If CO levels in interior living spaces exceed outdoor levels, potential sources will be investigated and appropriate action taken to reduce them (e.g., have a qualified professional tune, repair, or replace improperly operating combustion appliances; apply weather stripping or conduct air sealing between the garage or crawl space and the home)

Objective(s):

Ensure occupant health and safety

Ensure indoor CO levels do not exceed outdoor CO levels

2.2.3.3.2 - Occupant education

Specification(s):

Occupants will be educated on the operation and maintenance of the CO alarm

Completed work on combustion appliances and recommended maintenance will be reviewed with occupant

Occupant will be provided information regarding the health effects and risk of high CO concentrations; EPA provides possible expanded actions and offers client education information in an appendix to the protocols

Objective(s):

Ensure occupant can operate and maintain installations

Inform occupant regarding possible CO hazards

2.3 Safety Devices

2.3.1 Combustion Safety Devices

2.3.1.1 - Smoke Alarm

Desired Outcome:

Properly installed smoke alarms

Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

2.3.1.1.1 - Smoke alarm (hardwired)

Specification(s):

When installing hardwired smoke alarms, it will be listed and labeled in accordance with UL 217 and installed in accordance with the IRC or as required by the authority having jurisdiction

Objective(s):

Ensure proper installation

Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

2.3.1.1.2 - Smoke alarm (battery operated)

Specification(s):

When installing battery operated smoke alarms, it will be installed in accordance with manufacturer specifications

Objective(s):

Ensure proper installation

2.3.1.2 - Carbon Monoxide (CO) Alarm or Monitor

Desired Outcome:

Customer education towards properly installed CO alarms or monitors

Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

2.3.1.2.1 - CO detection and warning equipment (hardwired)

Specification(s):

When installing a hardwired CO detection or warning equipment it shall be installed in accordance with the ASHRAE 62.2-2013 or as required by the authority having jurisdiction

Installation will be accomplished by a licensed electrician when required by the authority having jurisdiction

Objective(s):

Ensure proper installation

2.3.1.2.2 - CO detection and warning equipment (battery operated)

Specification(s):

When installing battery-operated CO detection or warning equipment it shall be installed in accordance with the ASHRAE 62.2-2013 and manufacturer specifications as required by the authority having jurisdiction

Objective(s):

Ensure proper installation

2.4 Moisture

2.4.1 Air Sealing

2.4.1.1 - Air Sealing Moisture Precautions

Desired Outcome:

Ensure durability of repairs and reduce potential for occupant exposure to mold and other moisture- related hazards

2.4.1.1.1 - Moisture precautions for attics

Specification(s):

Roof leaks will be repaired before performing attic air sealing or insulation

Moisture sources in the house that can generate moisture into the attic will be identified and removed or reduced

Where possible, water resistant sealants and/or closed cell foams will be used in cold climates.

Plastic, foil, or any other Class 1 vapor barrier will not be used in hot humid climates

Objective(s):

Ensure durability of repairs

Reduce potential for occupant exposure to mold and other moisture-related hazards

Prevent moisture from communicating from within the conditioned space into unconditioned attic space.

Increase durability of seal

Avoid moisture-related damage to the home

2.4.1.1.2 - Moisture precautions for crawl spaces

Specification(s):

Exposed earth will be covered with a continuous, durable, sealed Class 1 vapor retarder a minimum of 6 mils in thickness

Any vapor retarder shall not encapsulate wood building materials or spray foam

Holes between the crawl space and the living space will be sealed

Objective(s):

Ensure durability of repairs

Reduce potential for occupant exposure to mold and other moisture-related hazards

2.4.1.1.3 - Moisture precautions for the living space

Specification(s):

Moisture sources in the home will be identified and removed or reduced

Local ventilation will be installed where appropriate (e.g., baths, kitchens) and vented to outside according to ASHRAE 62.2-2013

Unvented combustion appliances that are not listed to ANSI Z21.11.2 will be removed

Objective(s):

Ensure durability of repairs

Reduce potential for occupant exposure to mold and other moisture-related hazards

2.4.1.1.4 - Moisture precautions for exterior water

Specification(s):

Before air sealing basement or crawl space walls near wet areas, surface water pooling near the foundation will be addressed by:

- Repairing, modifying or replacing gutters and downspouts
- Grading and subsurface drainage at critical locations (e.g., localized drain and grading beneath valleys) in accordance with Environmental Protection Agency (EPA) Indoor airPLUS Construction Specifications Section 1.1
- Possible mitigation by waterproofing or installing draining plane with constructionadhesive

Objective(s):

Reduce potential for occupant exposure to mold and other moisture-related hazards

2.4.1.2 - Vented Crawl Space—Venting

Desired Outcome:

Pollutants effectively vented

2.4.1.2.1 - Venting

Specification(s):

Venting will be performed in accordance with the IRC or the authority having jurisdiction

Objective(s):

Provide ventilation for pollutant sources (e.g., moisture, radon, soil gases)

2.4.2 Drainage

2.4.2.1 - Drainage

Desired Outcome:

Move water away from home

2.4.2.1.1 - Work Assessment

Specification(s):

Installer pre-work assessment will be conducted to determine:

- Exterior grading
- Roof drainage
- Exterior waterproofing
- Interior grading
- Interior drainage

Objective(s):

Verify scope of work

Ensure that work space is ready for work

2.4.2.1.2 - Corrective Action

Specification(s):

Ground will be sloped away from the house at a rate of 6" of fall within 10'

If downspouts are present (e.g., gutters, overhangs, French drain), they will be drained a minimum of 6' away from the house

Foundation walls will be waterproof

Exterior foundation drains will be installed

Interior grading will be sloped to one or more collection points, if possible

One or more drains or sump pumps will be installed

Objective(s):

Drain water away from the foundation wall

Prevent roof water from leaking into the crawl space or basement

Prevent water from leaking into the crawl space or basement

Collect interior water for removal

Remove interior water from the crawl space or basement

2.4.2.1.3 - Occupant Education

Specification(s):

Occupant will be educated on the benefit of trees and shrubs to reduce heat gain and provide wind breaks in high wind locations

Occupant will be educated on the need to maintain positive drainage (e.g., gutters, down spouts, grading), exterior waterproofing and interior drainage

Objective(s):

Maintain durability

Ensure water is moved out, down and away from home

2.4.3 Vapor Barriers

2.4.3.1 - Vented Crawl Spaces—Ground Moisture Barrier

Desired Outcome:

Durable, effective ground moisture barrier provides long-lasting access and minimizes ground vapor

2.4.3.1.1 - Material Integrity

Specification(s):

Care will be taken to prevent punctures during installation

Objective(s):

Protect ground moisture barrier from damage during other crawl space work

2.4.3.1.2 - Coverage

Specification(s):

A ground moisture barrier that covers the exposed crawl space floor will be installed

Objective(s):

Reduce ground moisture entering the crawl space

2.4.3.1.3 - Material specification

Specification(s):

A ground moisture barrier with a rating of no more than 0.1 perm will be used

A ground moisture barrier will be used that meets tear and puncture resistance standard ASTM E1745

Homeowner will be advised that all plastic is biodegradable and will have a life span much shorter than the home (5 years), and it will need replacing to remain effective

Objective(s):

Ensure crawl space is accessible for service and maintenance without damaging the integrity of the ground moisture barrier

2.4.3.1.4 - Overlap seams

Specification(s):

When seams exist, they will be overlapped a minimum of 12" using reverse or upslope lapping technique

Objective(s):

Keep water under the liner

Reduce the likelihood of damage at seams

2.4.3.1.5 - Fastening

Specification(s):

When ground moisture barrier is installed on sloping ground, may be exposed to wind, or accessed for routine maintenance or storage it will be fastened to ground with durable fasteners or ballast(s)

Objective(s):

Prevent movement of the ground moisture barrier

2.4.3.2 - Closed Crawl Spaces—Ground Moisture Barriers

Desired Outcome:

Durable, effective air barrier and ground moisture barrier provide ongoing access and minimize ground vapor

2.4.3.2.1 - Material Integrity

Specification(s):

Care will be taken to prevent punctures during installation

Objective(s):

Protect ground moisture barrier from damage during other crawl space work

2.4.3.2.2 - Coverage

Specification(s):

An air barrier and ground moisture barrier, covering the exposed crawl space floor, will be installed and sealed to the wall's air and moisture barrier in accordance with ASTM E1643 and manufacturer's recommendations

Ground moisture barrier will be fastened to ground in accordance with manufacturer's recommendations and extend a minimum of 6 inches up the foundation wall

Objective(s):

Reduce ground moisture entering the crawl space

Create a continuous and durable connection between the wall and ground air and moisture barriers

2.4.3.2.3 - Material specification

Specification(s):

A ground moisture barrier with a rating of no more than 0.1 perm will be used

A ground moisture barrier will be used that meets tear and puncture resistance standard ASTM E1745

Homeowner will be advised that all plastic is biodegradable and will have a life span much shorter than the home, and it will need replacing to remain effective

Objective(s):

Reduce ground vapor entering the crawl space

Ensure crawl space is accessible for service and maintenance without destroying the integrity of the moisture barrier

2.4.3.2.4 - Overlap seams

Specification(s):

When seams exist, they will be overlapped a minimum of 12" with reverse or upslope lapping technique

For wall to floor connection, the wall moisture barrier will be installed under the ground moisture barrier

Objective(s):

Keep water under the liner

2.4.3.2.5 - Fastening

Specification(s):

When ground moisture barrier is installed on sloping ground, or accessed for routine maintenance or storage it will be fastened to ground with durable fasteners or ballast(s)

Objective(s):

Prevent movement and uplift of the air barrier and ground moisture barrier

2.4.3.2.6 - Sealing seams

Specification(s):

A durable sealant compatible with the air barrier and ground moisture barrier will be used

Objective(s):

Maintain continuous air barrier and ground moisture barrier

2.4.3.2.7 - Air barrier, ground moisture barrier penetrations, including fastener penetrations

Specification(s):

A durable sealant, compatible with the air barrier and ground moisture barrier, will be used

Physical attachments will be provided where practical (e.g., masonry columns, footings)

Objective(s):

Maintain continuous air barrier and ground moisture barrier

2.4.3.2.8 - Drainage

Specification(s):

The air barrier and ground moisture barrier will not interfere with the established drainage pattern

Objective(s):

Ensure proper drainage

2.4.3.2.9 - Drainage points

Specification(s):

Interior drainage collection points will be accessible from above and below the air barrier and ground moisture barrier

Objective(s):

Remove water above and below the air barrier and ground moisture barrier

2.4.3.3 - Closed Crawl Spaces—Vapor Retarders on Walls

Desired Outcome:

Durable, effective vapor retarder minimizes leakage from ground and air

2.4.3.3.1 - Air barrier and vapor retarder

Specification(s):

An air barrier and vapor retarder will be installed on the interior side of the exterior wall in accordance with IRC

Objective(s):

Prevent air and moisture penetration

2.4.3.3.2 - Coverage

Specification(s):

An air barrier and vapor retarder will be installed a minimum of 1' or as high as possible above outside grade

Objective(s):

Prevent air and moisture penetration

2.4.3.3.3 - Termite inspection gap

Specification(s):

Where termite pressure exists or local code requires, a 3" inspection gap will be maintained from the top of the insulation to the bottom of any wood

Objective(s):

Allow for termite detection

2.4.3.3.4 - Attachment

Specification(s):

Vapor retarder will be attached with a durable connection

Vapor retarder will be sealed at punctures and all 12" overlapped seams to prevent air entry

Objective(s):

Ensure vapor retarder maintains a fixed position on the exterior wall

Ensure vapor retarder is air tight

2.4.3.3.5 - Piers and interior walls

Specification(s):

Vapor retarder will be installed a minimum of 6" above interior grade

Vapor retarder will be attached with a durable connection

Vapor retarder will be sealed at punctures and all 12" overlapped seams to prevent air entry

Objective(s):

Prevent ground moisture penetration

2.4.4 Space Conditioning

2.4.4.1 - Stand-Alone Dehumidifiers

Desired Outcome:

Energy used to control humidity in conditioned spaces reduced

2.4.4.1.1 - Selection

Specification(s):

Equipment will have a minimum efficiency level of ENERGY STAR® or better

Equipment will have a fan-off option

Equipment will retain settings after power-off

Equipment will have features that reduce both peak electric use (e.g., internal and external timers) and absolute energy use

Equipment will have standby losses of 1 watt or less

Controls will be labeled so they are understandable, readable, and accurate for occupant needs

Systems located in a basement or crawl space will be rated for cold temperature operation

Operating environment will be determined and appropriate equipment will be selected for that environment (e.g., low temperature and high relative humidity)

Objective(s):

Reduce energy use

Provide durable equipment

Control moisture

Provide equipment appropriate for occupant use

2.4.4.1.2 - Installation

Specification(s):

Installation will proceed only when the following applicable steps have been taken to control moisture:

- Downspouts are re-directed away from foundation
- Moisture from drying clothes is vented to the outside
- Sump pit is covered and sealed
- Dirt in crawl space is covered with a vapor barrier
- Plumbing leaks are eliminated

Equipment will be installed according to manufacturer specifications and meet all applicable codes

Equipment will be installed to permit adequate air flow

Equipment will have a timer for off-peak operation if time-of-use program is available and if the equipment can handle power interruptions

Any penetrations to the exterior of the home created by the installation of the appliance will be sealed

Initial relative humidity and temperature settings will be set by the installer to ensure the space does not reach dew point

Operation of controls and needed maintenance will be reviewed with occupant

A user guide for dehumidifier settings in different climate conditions will be created by the installer and provided to the occupant

Installer will commission the equipment to ensure it is functioning properly

An independent measurement will be made to verify relative humidity

System will be connected directly to condensate line that drains to a plumbing drain or the exterior, away from the home's foundation and in compliance with the plumbing code or the authority having jurisdiction

Specific information on the proper maintenance of the equipment will be provided to the occupant

Warranty information, operation manuals, and installer contact information will be provided to the occupant

Objective(s):

Reduce or retire dehumidifiers

Reduce allergens and asthma triggers Improve health and reduce irritants

Improve building durability

Improve comfort

Reduce pest populations

Reduce risk of mold issues

Educate occupant on how to operate and maintain equipment

2.4.4.1.3 - Decommissioning

Specification(s):

Removed equipment will be recycled or disposed of properly in accordance with local regulations

Objective(s):

Prevent the reuse of inefficient equipment and its components

Reduce waste

Protect the environment

2.4.4.2 - Crawl Spaces—Preliminary Dehumidification

Desired Outcome:

A dry and moisture controlled space ensured

2.4.4.2.1 - Close vents

Specification(s):

Vents and other openings will be closed after ensuring sufficient combustion air for fuel-burning appliances in accordance with IRC

Objective(s):

Reduce moisture load coming from outside of the crawl space

2.4.4.2.2 - Drying

Specification(s):

If liquid moisture is present, the area will be dried until any liquid moisture is eliminated

Objective(s):

Improve work environment

Reduce moisture in the crawl space

2.4.4.2.3 - Drying time

Specification(s):

Space will be dehumidified until wood moisture content in solid, untreated lumber is less than 20%

Objective(s):

Reduce moisture content of wood

2.4.4.3 - Closed Crawl Spaces—Crawl Space Conditioning

Desired Outcome:

Humidity in closed crawl space is controlled to reduce moisture damage, energy consumption, and pests

2.4.4.3.1 - Option 1: dehumidifier

Specification(s):

Option 1 may be used in combination with any other specified options

A permanent, low-temperature, auto-restart, minimum ENERGY STAR® rated dehumidifier will be installed with a minimum rated capacity of 15 pints per day

Condensate will be drained to daylight or a condensation pump

A return pathway from the crawl space to the living space will not be allowed

Objective(s):

Maintain low relative humidity

Reduce conditions conducive to pest activity

Reduce conditions conducive to mold growth and wood rot

Improve IAQ in the conditioned space

Improve equipment service life

Save energy in cooling-dominated climates

Improve IAQ in the living space

2.4.4.3.2 - Option 2: supply air

Specification(s):

Option 2 may be used in combination with any other specified options

Air from a central forced-air conditioning system will be supplied at a rate of 1 cubic foot per minute (CFM) per 30 square feet of closed crawl space area

The supply air duct will be fitted with a backflow damper

Objective(s):

Maintain low relative humidity

Reduce conditions conducive to pest activity

Reduce conditions conducive to mold growth and wood rot

Improve IAQ in the conditioned space

Improve equipment service life

Save energy in cooling-dominated climates

Prevent crawl space air from entering the living space when forced air system is off

2.4.4.3.3 - Option 3: conditioned house air

Specification(s):

Option 3 may be used in combination with any other specified options

A continuous-duty, Home Ventilation Institute (HVI)-rated, 1-sone or less fan will be installed that supplies 1 CFM of conditioned house air per 50 square feet of closed crawl space area

Optional: An air relief vent to the outside having backdraft protection may be installed

A return pathway from the crawl space to the living space will not be allowed

Objective(s):

Maintain low relative humidity

Reduce conditions conducive to pest activity

Reduce conditions conducive to mold growth and wood rot

Improve IAQ in the conditioned space

Improve equipment service life

Save energy in cooling-dominated climates Improve IAQ in the living space

2.4.4.3.4 - Option 4: exhaust

Specification(s):

A continuous-duty, HVI-rated, 1 sone or less fan will be installed that exhausts 1 CFM of closed crawl space air per 50 square feet of closed crawl space area

This option will not be installed for exhaust crawl space ventilation if a radon mitigation system is installed or anticipated in the crawl space

Objective(s):

Maintain low relative humidity

Reduce conditions conducive to pest activity

Reduce conditions conducive to mold growth and wood rot

Improve IAQ in the conditioned space

Improve equipment service life

Save energy in cooling-dominated climates

2.4.4.3.5 - Monitoring alarm system

Specification(s):

A durable humidity monitoring system with alarm capability will be installed

A minimum expected service life of 10 years will be ensured

Objective(s):

Alert occupant to system failure

2.4.4.4 - Basements—Dehumidification

Desired Outcome:

Basement humidity controlled with supplemental dehumidification

2.4.4.4.1 - Dehumidifier

Specification(s):

A permanent, low-temperature, auto-restart, minimum ENERGY STAR® rated dehumidifier will be installed

Manufacturer specifications will be followed for size and use

Condensate will be drained to daylight or a condensation pump

Objective(s):

Maintain a dry basement

Reduce conditions conducive to mold growth, wood rot, and pests

2.4.4.4.2 - Dehumidification for divided spaces

Specification(s):

Drying will be provided to all basement areas

Objective(s):

Maintain a dry basement

Reduce conditions conducive to mold growth, wood rot, and pests

2.4.4.4.3 - Relative humidity

Specification(s):

All basement spaces will be maintained at a relative humidity that ensures condensation will not occur on cool surfaces

Objective(s):

Maintain a dry basement

Reduce conditions conducive to mold growth, wood rot, and pests

2.4.4.4.4 - Condensing surfaces (e.g., cold water pipes)

Specification(s):

Condensing surfaces in basement will be insulated and sealed

Objective(s):

Maintain a dry basement

Reduce conditions conducive to mold growth, wood rot, and pests

2.4.4.4.5 - Dehumidification (option for dry climates and heating-dominated climates seasonally)

Specification(s):

Ventilation in the basement will be controlled to maintain relative humidity that ensures condensation will not occur on cool surfaces

Objective(s):

Maintain a dry basement

Reduce conditions conducive to mold growth, wood rot, and pests

2.4.4.4.6 - Occupant education

Specification(s):

Occupant will be educated on how and when to change filter and clean condensate drain of the dehumidifier in accordance with manufacturer specifications

Objective(s):

Ensure occupant health

Preserve integrity of system

2.5 Radon

2.5.1 Air Sealing

2.5.1.1 - Radon—Air Sealing Considerations, Basements, and Crawl spaces

Desired Outcome:

Work completed without increasing occupant exposure to radon

2.5.1.1.1 - Radon testing and mitigation

Specification(s):

Radon testing and mitigation will be done in accordance with the Environmental Protection Agency (EPA) Healthy Indoor Environment Protocols for Home Energy Upgrades

Objective(s):

Reduce potential for occupant exposure to radon

2.6 Electrical

2.6.1 Knob and Tube Wiring

2.6.1.1 - Knob and Tube Wiring

Desired Outcome:

Live unsafe wiring identified and brought to local codes

Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

2.6.1.1.1 - Knob and tube identification

Specification(s):

Contractor, assessor, auditor, or similar will inspect and assess the house to identify knob and tube wiring

Objective(s):

Ensure occupant safety

Preserve the integrity and safety of the house

2.6.1.1.2 - Live wire testing

Specification(s):

Non-contact testing method will be used to determine if wiring is live

Objective(s):

Protect occupant safety

Preserve the integrity and safety of the house

2.6.1.1.3 - Isolation and protection

Specification(s):

Proper clearance will be maintained around live knob and tube as required by the National Electrical Code (NEC) or authority having jurisdiction

When required, a dam that does not cover the top will be created to separate insulation from the wire path

Objective(s):

Ensure occupant safety

Preserve the integrity and safety of the house

2.6.1.1.4 - Replacement

Specification(s):

Wiring will be replaced with new appropriate wiring in accordance with the NEC National Electrical Code and local codes

Old wiring will be rendered inoperable by licensed electrician in accordance with the NEC National Electrical Code and local codes

Objective(s):

Ensure occupant safety

Preserve the integrity and safety of the house

2.7 Occupant Education and Access

2.7.1 Basement and Crawl Spaces

2.7.1.1 - Crawl Spaces—Providing New Access

Desired Outcome:

Access to the closed crawl space is controlled and the ground moisture barrier is protected to maintain the integrity of the system

2.7.1.1.1 - Crawl Spaces - Providing New Access

Specification(s):

Crawl space will be accessible in accordance with IRC

Access to mechanical equipment located in the crawl space will be in accordance with IRC

Service and maintenance of the crawl space and equipment will be performed without risk of damage to the thermal barrier, air barrier, and ground moisture barrier in accordance with IRC

Objective(s):

Provide crawl space access

Maintain integrity of the crawl space system

2.7.1.1.2 - Security

Specification(s):

At client's/resident's discretion, a lockable access will be provided if access is from the exterior.

Objective(s):

Control access and prevent intruders

2.7.1.2 - Crawl Space Information Sign

Desired Outcome:

Posted signs inside of the crawl space provide essential safety and maintenance information to occupant and users of the crawl space

2.7.1.2.1 - Sign specifications

Specification(s):

A durable, easily seen sign will be installed at all accesses inside of the crawl space (minimum 8 ½" x 11")

A minimum expected service life of 10 years will be ensured

Objective(s):

Prevent damage to the crawl space after upgrade

2.7.1.2.2 - Sign content

Specification(s):

Those entering the crawl space will be cautioned not to damage the air barrier, ground moisture barrier, insulation, and mechanical components specific to the crawl space type

Anyone entering the crawl space will be alerted that immediate repairs are needed in case of damage

Installer contact information will be included on the sign in case there are questions or needs for repairs

Objective(s):

Prevent damage to the crawl space after upgrade

Educate anyone entering the crawl space

Provide occupants with a way to contact the installer

2.7.1.2.3 - Hazard warning

Specification(s):

Language prohibiting storage of hazardous and flammable materials will be provided on site

Objective(s):

Prevent storage of hazardous or flammable materials in the crawl space Maintain indoor air quality

Prevent a fire hazard

2.7.1.3 - Crawl Space—Occupant Education

Desired Outcome:

Occupants educated on the crawl space system and how to maintain it

2.7.1.3.1 - Written communication

Specification(s):

Occupants will be given written documentation that describes components of the system, maintenance requirements, and health and safety considerations at a minimum

Information will be provided in simple terms

Text and pictures will be used

Documentation may be provided electronically

Literacy levels and language of occupants will be considered in selecting appropriate materials

Objective(s):

Provide occupant with a basic understanding and documentation of the system, its maintenance, and related health and safety issues

2.7.1.3.2 - Oral communication

Specification(s):

When possible, the written documents will be reviewed with the occupants

Objective(s):

Confirm that occupants have received the information

Provide an opportunity for questions and answers

2.7.1.3.3 - Contact information

Specification(s):

Information about the installing program ally and warranty will be provided

Objective(s):

Provide occupants with a way to contact the installer

2.7.2 Installed Equipment

2.7.2.1 - Warranty and Service Agreement

Desired Outcome:

Occupants provided recourse for failures in materials, workmanship, and serviceability and informed of potential hazards

2.7.2.1.1 - Warranty

Specification(s):

A minimum 1-year warranty for materials, workmanship, and serviceability will be provided to occupants upon completion of work

Objective(s):

Provide recourse to occupants for failures in materials, workmanship, and serviceability

2.7.2.1.2 - Warranty and Maintenance Agreement - Client Education

Specification(s):

Provide occupants with manufacturers' warranties on installed equipment and inform of installer maintenance agreement options

Share information on company related annual inspections and maintenance agreements as well as manufacturer related warranty details

Objective(s):

Ensure occupants are aware of warranty and maintenance agreement options

2.7.2.1.3 - General conditions

Specification(s):

At a minimum, the following concerns and warnings will be addressed within the warranty, as applicable to the work being warrantied:

- Possible drying and shrinking effects
- Storage of hazardous and flammable materials
- Mold

Objective(s):

Educate occupants on potential hazards

Appendix A

Energy Efficiency Residential Assessment Procedure

The following procedure was developed for Combustion Appliance and Fuel Distribution System inspections by Energy Advisors and Program Allies assessing residential homes in association with AIC's Energy Efficiency program . These assessments are conducted per BPI (Building Performance Institute) guidelines. The AIC Energy Efficiency department, in partnership with AIC operations leadership, developed the procedure in response to safety and operational concerns.

1. The Energy Advisor shall sample the indoor ambient air, upon entering the home, in at least one location per floor of occupied space, using a both the sense of smell and Combustible Gas Detection (CGD) equipment;
2. Conduct testing for gas leakage on the customer's gas pipe at connections of natural gas piping starting after the union on the right side of the Ameren Illinois gas meter (see photo below);
3. At the first instance of the presence of a combustible fuel gas in the ambient air is suspect, or upon discovery of a potential leak at a gas piping connection, the Energy Advisor shall cease all further activity and inform the homeowner/occupants immediately that there is potentially a gas leak (If a leak is identified on gas piping, please stop all further activity immediately, *do not attempt to identify additional gas leaks*);
4. Request that the homeowner/occupants leave the building immediately, and exit the building with them, without using a phone or other electrical device while in the home;
5. From outside of the home, the Energy Advisor will call Ameren Illinois at 800.755.5000, report the possibility of a gas leak at the home, and provide the service representative with the customer's immediate contact information (e.g. cell phone number, address or phone number of neighbor where customer intends to wait during investigation by AIC gas operations);
6. One call to the 800 number per location is preferred. Multiple leak calls from the same address may result in resources being unnecessarily routed;
7. The Energy Advisor will remain on-site, but outside of the building, until qualified AIC gas operations personnel arrive and render the home safe to re-enter.

Addendum

a. Ameren has recently implemented a new process for the Contact Center when handling a call due to a blowing gas situation. The intent of this new process is to determine whether or not there is a blowing gas situation which is the direct result of digging, excavation, boring, etc. so that we can dispatch two people to the scene for a more effective response when the likelihood for migrating gas is greater. Your Energy Efficiency Auditors may have noticed that the Contact Center is asking two additional questions at the beginning of the call to determine whether or not a two person response is necessary. When they call into the Contact Center to report a leak, please advise them to apply the following definition when they answer the question "is there blowing gas?": "Blowing Gas is when natural gas is forcefully escaping through an opening in a pipe or fitting that has been ***broken, cracked or damaged***." For instance, if an auditor smells gas at the meter and hears the normal operation of the meter and regulator, the blowing gas question should be answered "no". However, in the unlikely event that an auditor comes across a gas service that has been cut and is blowing due to excavation or boring, they should answer "yes".
b. As of November 2017, the Contact Center is no longer asking if the odor is faint or strong, we are evacuating on all inside odor complaints. Going forward, if an auditor notices an odor of gas or picks up an indication on their instrument, they should be instructing the customer to leave the premise and the auditor should leave as well until Ameren personnel arrive and determine the severity of the leak.
c. We should only be checking the fittings of the customers piping, not the Ameren Illinois piping side of the meter.