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APPENDIX I
NEBRASKA ENERGY OFFICE
2014 WEATHERIZATION
INSTALLATION MEASURES
AND
WORK STANDARDS
November, 2014

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**MEASURES AND WORK STANDARDS
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HEALTH AND SAFETY

Major hazards and potentially life-threatening conditions must be corrected before *weatherization* installers can work in the dwelling unless the installers are making the corrections.

When a *weatherization* agency finds serious safety problems in a customer's home, they should inform the customer in writing about the hazards.

Some of the most common home health hazards associated with *weatherization* are:

- ❖ Carbon monoxide
- ❖ Moisture accumulation
- ❖ Lead-based paint dust
- ❖ Unsanitary conditions
- ❖ Insects, reptiles, and other animals

Weatherization employees should also be aware of home health and safety hazards that aren't directly related to *weatherization*.

WHEN NOT TO WEATHERIZE A DWELLING

There are some conditions and situations under which a sub-grantee must not or may choose not to weatherize an otherwise eligible *dwelling unit*. Information for making this determination may become evident during either the eligibility process or during the initial inspection.

If the sub-grantee makes a determination that there are circumstances that prevent the *weatherization* process from proceeding, they must:

- ❖ Advise the client of the problem, and, if possible, refer the client to other service organizations that may be able to assist in solving the problem.
- ❖ Inform the client in writing as to why the dwelling cannot be weatherized. A copy of the letter must be in the client file.
- ❖ Provide documentation of the conditions that the client must correct before *weatherization* services are provided.
- ❖ Clearly indicate in the client file why the dwelling was given "deferral" status.
- ❖ Have available a system for a timely and fair administrative hearing of complaints received from clients denied services. An unreasonable delay in acting on an application for assistance will constitute grounds for a hearing.
- ❖ Provide the client with a completed copy of the Nebraska WAP *Weatherization* Deferral Notice, which can be downloaded at <http://www.neo.ne.gov/wx/news/forms/DeferralNoticeform4.pdf>.

At the time of application, the applicant is given a written notice outlining the applicant's rights and the method to file a complaint. All Sub-grantees are required to adhere to their agency's grievance policies. If the grievance cannot be resolved through the Sub-grantee's process, the applicant will file a complaint with Energy Office.

A *sub-grantee* **must not** weatherize if:

- ❖ The unit was weatherized with *DOE* funds after September 30, 1994. For current *DOE* guidelines and further explanation see *DOE* regulations in CFR440.
- ❖ The dwelling is vacant. (Exception: multifamily units using *DOE* funds and the 50% or 66% rule).
- ❖ Demolition of the dwelling is scheduled in the next 12 months.
- ❖ The dwelling is for sale.
- ❖ The dwelling has serious structural problems that make *weatherization* impossible or impractical.
- ❖ The *heating system* has not passed a safety and operational *audit* and inspection.

- ❖ The building structure is in such state of disrepair that failure is imminent and the conditions cannot be resolved cost-effectively.
- ❖ The house has sewage or other sanitary problems that would further endanger the client and *weatherization* installers if *weatherization* work were performed.
- ❖ The house has been condemned by local or state building or enforcement officials.
- ❖ Moisture and/or mold problems are so severe they cannot be resolved with minor repairs.
- ❖ The occupant or client is abusive or threatening to the crew, subcontractors, *auditors*, inspectors or others who must work on or visit the house.

A *sub-grantee* **may choose** not to weatherize a *dwelling unit* if:

- ❖ The building *mechanical systems*, including electrical and plumbing, are in such state of disrepair that failure is imminent and the conditions cannot be resolved cost-effectively.
- ❖ The extent and condition of lead-based paint in or on the house would potentially create further health and safety hazards.
- ❖ In the judgment of the energy *auditor*, any condition exists which may endanger the health and/or safety of the occupant, work crew or subcontractor, the work should not proceed until the condition is corrected.
- ❖ There are unusual situations which in the judgment of the *auditor/sub-grantee* must be corrected before providing *weatherization* services.

CLIENT HEALTH AND SAFETY

There are a number of important health and safety issues related to *weatherization* work that can impact *weatherization* employees as well as clients. When any of these issues are detected, the client must be informed of the issue and, if possible, addressing these problems should be a top priority.

Test combustion appliances and homes for *carbon monoxide* and other related hazards and solve problems causing these hazards.

Find moisture problems and discuss them with the client. See “*Mold and Moisture*” on page XX screen.

Some hazards are not related to *weatherization* but pose a great danger to occupants. Referrals should be discussed with the client regarding other resources such as local human service agencies.

HEALTH AND SAFETY ASSESSMENT

Energy Auditors and crews/subcontractors are required to take all reasonable precautions against performing work on homes that will subject workers or clients to health and safety risks. The initial home inspection shall include a health and safety assessment of the dwelling. The assessment shall include interviewing the client regarding known health concerns, inspecting the dwelling for present or potential moisture concerns, indoor air quality concerns and other environmental concerns or hazards that may or may not be covered by the WAP. In addition, clients will receive the following publications or documents when applicable:

- ❖ Health & Safety Assessment Consent
- ❖ Health and Safety Home Screening Questionnaire
- ❖ Renovate Right (occupants of all buildings built pre-1978)
- ❖ Lead Hazard Pre-Renovation Form
- ❖ Nebraska Radon Information Fact Sheet
- ❖ A Brief Guide to Mold, Moisture and your Home
- ❖ Nebraska Mold Assessment and Release Form

- ❖ Consumer Product Safety Asbestos Fact Sheet
- ❖ Nebraska WAP Even More Dollar and Energy Savings Brochure
- ❖ Weatherization Deferral Notice
- ❖ Consent to Perform Work
- ❖ Client Education Confirmation of Receipt

(These forms can be downloaded at <http://www.neo.ne.gov/wx/news/wxassist.htm>)

Sub-grantee personnel will interview and assist clients in completing a Health and Safety Home Screening Questionnaire (<http://www.neo.ne.gov/wx/news/forms/HealthScreeningQuestionnaire7.pdf>) as part of the application process. The survey will be included in the client file for future reference. The Energy Auditor will then review the Questionnaire with the client at the time of the initial assessment. The information collected during this process will be used in determining the best course of action for *weatherization* of the home. When a client's health is fragile and/or the *weatherization* activities would constitute a health or safety hazard, the occupants at risk will be required to leave the home during the activities and requested to return at least 1 hour (or a reasonable time as determined by the installers) after installers are scheduled to leave to allow for clean-up and appropriate ventilation of the home. If it is determined through the Health and Safety Home Screening Questionnaire that someone in the home is sensitive to a product that is intended to be used during the *weatherization* process, the sensitivity shall be documented in the file and, if possible, an alternative product may be used. If no successful alternative is found, the *weatherization* of the home may proceed without completion the measure with no impact on *weatherization* measures with lower SIRs, **with prior Nebraska Energy Office approval**. *Weatherization* funds cannot be used to relocate clients or reimburse them for such costs incurred as a result of the requirement to leave during the day. If the client is unable to leave the home and the intended work may exacerbate an occupant's health condition, the home may need to be deferred.

Sub-grantees must take all reasonable precautions against performing work on homes that would subject clients to health and safety risks.

Worker Health and Safety

Grantee *weatherization* staff shall not be required to work in unsafe and/or excessively unsanitary conditions. Costs related to grantee health and safety training shall be charged to *T&TA*.

- ❖ Sub-grantee crews and contractors must comply with Occupational Safety and Health Administration (OSHA) standards and Material Safety Data Sheets (MSDS) and take precautions to ensure the health and safety of themselves and other workers, including the use of personal protection equipment.
- ❖ OSHA 10 hour training is required for all *weatherization* workers.
- ❖ OSHA 30 hour training is required for all crew leaders.
- ❖ Cost incurred by *sub-grantees* to comply with OSHA requirements may be charged to the Health and Safety budget category.
- ❖ MSDS documentation for all materials installed through the Nebraska *Weatherization* Program shall be maintained on site and on file by each program *sub-grantee*.
- ❖ OSHA standards including, but not limited to:

- ⊗ respirator protection,
- ⊗ techniques for safely lifting heavy objects,
- ⊗ electrical equipment safety,
- ⊗ ladder safety, and
- ⊗ general worker protection.
- ❖ Sub-grantees shall consult OSHA standards for further details.
- ❖ Personal protective equipment shall be worn when appropriate. First aid supplies shall be available in the office and at the job site.

Potential Hazard Considerations

Weatherization services shall be provided in a manner that minimizes risk to workers and clients. Awareness of potential hazards is essential in providing quality *weatherization* services. A list of common hazards is discussed below.

Air Conditioning and Heating Systems	
<p>Action/Allowability</p> <ul style="list-style-type: none"> • “Red tagged”, inoperable or non-existent heating system replacement, repair, or installation is an allowable Health & Safety Cost. Repair of air conditioning systems is an allowable Health & Safety Cost. Replacement or installation of air conditioning system is not an allowable Health & Safety Cost. 	<p>Testing</p> <ul style="list-style-type: none"> • Make sure systems are present, operable, and performing. Determine presence of at-risk occupants.
<p>Client Education</p> <ul style="list-style-type: none"> • Discuss and provide information on appropriate use and maintenance of units and proper disposal of bulk fuel tanks when not removed. 	<p>Training</p> <ul style="list-style-type: none"> • Awareness of guidance.
Appliances and Water Heaters	
<p>Action/Allowability</p> <ul style="list-style-type: none"> • Replacement, repair and cleaning of water heaters are allowed on a case by case basis as a Health & Safety Cost. Repair, installation and cleaning of other appliances are not allowable Health & Safety costs. 	<p>Testing</p> <ul style="list-style-type: none"> • Determine whether appliances/ water heaters are performing safely. Combustion safety testing is required when combustion appliances are present.
<p>Client Education</p> <ul style="list-style-type: none"> • Discuss and provide information on appropriate use, maintenance, and proper disposal of appliances/water heaters. 	<p>Training</p> <ul style="list-style-type: none"> • Awareness of guidance, conduct diagnostic training.

ASBESTOS

Asbestos in Siding, Walls, Ceilings, Etc.

General Information:

- The costs associated with asbestos testing, remediation or removal are not eligible expenditures in the Nebraska *Weatherization Assistance Program*. If the presence of asbestos has been previously confirmed or if the Sub-grantee believes that the siding may contain asbestos:
 - Removal of siding is allowed to perform energy conservation measures, however precautions must be taken not to damage the siding. Asbestos siding should never be cut or drilled. Where possible, insulate the exterior walls through home interior.
- Inspect exterior wall surface and subsurface for possible asbestos siding prior to drilling or cutting.
- Blower door testing shall not be completed on homes where asbestos that has been disturbed is determined to be present by an appropriately trained crew leader, *auditor* or inspector or where testing has been completed verifying the presence of asbestos.
- Documentation regarding the presence of disturbed asbestos material by an appropriately trained crew leader, *auditor* or inspector or testing **must** be maintained in the client file.

Training Requirements:

- Crew leaders, *auditor* and inspectors shall be trained on how to recognize asbestos through an AHERA or other appropriately trained or certified asbestos control professional training.
- Cost incurred by *sub-grantees* to comply with asbestos training requirements may be charged to the Health and Safety budget category.

Client Education:

- Inform the client that suspected asbestos siding maybe present and how precautions will be taken.

Asbestos in Vermiculite

When vermiculite insulation is discovered precautions must be taken, and it may not be removed.

General Information:

- The costs associated with asbestos testing, remediation or removal are not eligible expenditures in the Nebraska *Weatherization Assistance Program*. If the presence of asbestos has been previously confirmed or if the Sub-grantee believes that vermiculite insulation is present:
 - The Sub-grantee shall take precautionary measures as if it contains asbestos, such as not using *blower door* tests and utilizing personal air monitoring while in attics.
 - When *blower door* tests are performed, it shall be performed using pressurization instead of depressurization.
- Removal of vermiculite insulation is not allowed.
- Blower door testing shall be completed on homes where vermiculite asbestos is determined to be present by using the door to establish a **positive** pressure for testing.
- Documentation regarding the presence of asbestos material by an appropriately trained crew leader, *auditor* or inspector or testing shall be maintained in the client file.

Training Requirements:

- Crew leaders, *auditor* and inspectors shall be trained on how to recognize asbestos through an AHERA or other appropriately trained or certified asbestos control professional training for encapsulation.
- Cost incurred by *sub-grantees* to comply with asbestos training requirements may be charged to the Health and Safety budget category. Clients should be instructed not to disturb suspected asbestos containing material.

Client Education:

- Provide asbestos safety information to the client.

Asbestos on Pipes, Furnaces, Other Small Covered Surfaces

Encapsulation and/or removal is not allowed through the Nebraska *Weatherization Assistance Program*.

General Information:

- The costs associated with asbestos testing, remediation or removal are not eligible expenditures in the Nebraska *Weatherization Assistance Program*. If the presence of asbestos has been previously confirmed or if the Sub-grantee believes that the pipe insulation may contain asbestos:
 - Sub-grantees shall assume asbestos is present and not disturb the covering materials.
- Blower door testing shall not be completed on homes where asbestos that has been disturbed is determined to be present by an appropriately trained crew leader, *auditor* or inspector or where testing has been completed verifying the presence of asbestos.
- Documentation regarding the presence of disturbed asbestos material by an appropriately trained crew leader, *auditor* or inspector or testing **must** be maintained in the client file.

Training Requirements:

- Crew leaders, *auditor* and inspectors shall be trained on how to recognize asbestos through an AHERA or other appropriately trained or certified asbestos control professional training for encapsulation.
- Cost incurred by *sub-grantees* to comply with asbestos training requirements may be charged to the Health and Safety budget category. Clients should be instructed not to disturb suspected asbestos containing material.

Client Education:

- Provide asbestos safety information to the client.

Biologicals and Unsanitary Conditions

Removal is not a *Weatherization* responsibility.

General Information:

- Addressing bacteria, viruses biological and/or unsanitary conditions is not an allowable activity.

Deferral Requirements:

- May be necessary in cases where a known agent is present in the home that may create a serious risk to occupants or *weatherization* workers.

Client Education:

- Inform client of observed conditions.
- Provide information on how to maintain a sanitary home, steps to correct deferral conditions and the impact on the safety of *Weatherization* workers who come into contact with these conditions.

Building Structure and Roofing

Program workers frequently encounter homes in poor structural condition however, building rehabilitation is beyond the scope of the *Weatherization Assistance Program*. *Weatherization* services may be delayed until the dwelling can be made safe for crews and occupants. Incidental repairs necessary for the effective performance or preservation of *weatherization* materials are allowed.

Deferral Requirements:

- Building structure rehabilitation and roofing is beyond the scope of the *Weatherization Assistance Program*.

Client Education:

- Notify client of structurally compromised areas.

Code Compliance

The Nebraska *Weatherization* Program does not fund the costs of bringing homes “up to” the latest building code requirements. However, any eligible energy efficiency work that is completed **as part of the weatherization work** must meet all state and local building code requirements.

General Information:

- The costs associated with building rehabilitation work that is not specifically associated with the implementation of a cost-effective, approved *Weatherization* Measure is beyond the scope of the *Weatherization* Assistance Program.
- It is each *sub-grantee's* responsibility to ensure that *weatherization*-related work conforms with the applicable codes in jurisdictions where the work is being performed. Examples of eligible costs associated with cost-effective *Weatherization* Measures include, but are not limited to: window replacements that provide appropriate egress and glass safety requirements, door replacements that provide appropriate minimum clear width for exiting, the installation of fans to provide appropriate ventilation in the home, appropriate disconnect switching and clearance requirements on furnace installations, etc. Costs associated with the purchase of any required permits are eligible. The cost of the permits shall not be passed onto the client.

Client Education:

- Inform client of observed code non-compliance issues.

Carbon Monoxide

Carbon monoxide (*CO*) is released by combustion appliances, automobiles, and cigarettes as a product of incomplete combustion.

CO is normally tested in the flue of vented appliances. *CO* is usually caused by one of the following:

- Overfiring
- *Backdrafting* of combustion gases smothering the flame
- Flame interference by an object (a pan over a gas *burner* on a range top, for example)
- Inadequate *combustion air*
- Flame interference by moving air
- Misalignment of the *burner*

General Information

- A *carbon monoxide (CO)* test shall be performed on all naturally drafting or induced draft combustion appliances at the time of the initial and quality control inspections. The *CO* levels shall be tested in the undiluted flue gases. *CO* tests shall not be performed on solid fuel burning appliances.
- If *CO* levels exceed 100-ppm as measured in the undiluted flue gases or 35-ppm in the *ambient air* at the time of the initial inspection, *weatherization* shall not proceed until the *CO* levels have been reduced.
- Installation of *Carbon Monoxide Detectors* is required when detectors are not present or are inoperable and a combustion appliance(s) is present.
 - *Unsafe water heaters* that cannot be repaired shall be replaced. Replacement is allowed on a case by case basis with Nebraska Energy Office approval if:
 - the unit's *CO* levels exceed 100-ppm as measured in the flue gases or 35-ppm in the *ambient air* at the time of the initial inspection and the *CO* levels cannot be reduced,
 - the unit has scorch marks that indicate past *backdrafting* occurrences, or the integrity of the water tank has been compromised as shown by signs of leakage.

Deferral Requirements:

- The building envelope shall not be weatherized if the owner or client refuses a safety inspection of the *heating system* or until any *heating system* deficiency has been repaired and/or the *heating plant* replaced.

Client Education:

- Provide client with combustion safety and hazards information, including the importance of using exhaust ventilation when cooking and the importance of keeping *burners* clean to limit the production of *CO*.
- Provide client with verbal and written information on the use of the *CO detector*.

Combustion Appliance Testing

Technicians who work in existing homes, especially low-income homes, must be able to test houses and combustion appliances properly, in order to ensure that everything is safe.

General Information:

- Prior to weatherizing the building envelope, all *eligible heating plants* over two (2) years of age that have not received a safety inspection during the twelve (12) months prior to the initial inspection shall be inspected by a qualified heating technician, utility company or *certified weatherization staff*.
- A backdraft test shall be performed at the time of Initial Inspection, the Quality Control and at the end of each work day if the project will require more than one day, on all vented naturally drafting combustion appliances. A backdraft test shall not be performed on solid fuel burning appliances.
- Combustion safety testing is required when combustion appliances are present.
- Inspect venting of combustion appliances and confirm adequate clearances.
- Test naturally drafting appliances for draft and spillage under worst case conditions before and after air tightening.
- Inspect cooking *burners* for operability and flame quality.
- The State of Nebraska's annual heating degree day normal, over the thirty year period from 1971-2000 is 6525, with January Mean °F temperatures that range from 23.2 in the warmest areas of the state to 22.8 in the coldest areas. Clients in units that contain *heating plants* that are inoperable or red-tagged are in danger of frost bite, hypothermia and other life threatening issues. Therefore units that contain *heating plants* that are inoperable or red-tagged at the time of the initial inspection shall not be weatherized until the *heating plant* has been repaired or replaced.
- Eligible *heating plants* that cannot be repaired shall be replaced.
- The replacement *heating plant* shall be properly vented. If the new *heating plant* will not be vented through the masonry *chimney*, but the water heater will still be vented through that *chimney*, a properly sized flue liner shall be installed. As an alternative, a power vent may be installed on the water heater.
- If a dwelling is heated by *unvented combustion space heaters* and an inoperable conventional *heating system* is present, the conventional *heating system* shall be repaired or replaced to eliminate the need for unvented space heaters. If the need for *unvented combustion space heaters* cannot be eliminated, the *sub-grantee* shall instruct the client regarding the dangers of *carbon monoxide* and excessive moisture levels, particularly if any unvented space heaters are left in the dwelling as a secondary heat source, or emergency back-up.
- If a dwelling utilizes *unvented combustion space heaters* as the primary heat source, the *unvented combustion space heaters* shall be replaced with a vented combustion *heating system*.
- Existing unvented gas clothes dryers shall be vented to the exterior. Gas dryer vent pipe should not be installed with sheet metal screws, rivets or other intrusive fasteners that will collect lint.
- Propane gas detectors shall be installed in homes and *mobile homes* on permanent foundations that have propane combustion appliances. The gas detectors shall be permanently installed according to the manufacturer's instructions and 110 volts.

Deferral Requirements:

- The building envelope shall not be weatherized if the owner or client refuses a safety inspection of the *heating system* or until any *heating system* deficiency has been repaired and/or the *heating plant* replaced.
- A *mobile home* has not adequately installed or constructed to provide appropriate stability.
- *Mobile homes* that have non-mobile home combustion water heaters.
- *Mobiles homes* that have non-mobile home solid fuel combustion *heating systems*.

Client Education:

- Provide client with combustion safety and hazards information, including the importance of using exhaust ventilation when cooking and the importance of keeping *burners* clean to limit the production of *CO*.
- Provide client with verbal and written information on the use of the *CO detector*.

Drainage - Gutters, Down spouts, Extensions, Flashing, Sump Pumps, Landscape, Etc.

Alleviating drainage issues is beyond the scope of the Nebraska WAP, however the following issues should be considered during the initial inspection and implementation of the work if drainage issues are encountered and presented to the client or home owner.

Deferral Requirements:

- Major drainage issues are beyond the scope of the *Weatherization* Assistance Program.
- Homes with conditions that may create a serious health concern should be deferred.

Client Education:

- Inform client of any observed conditions regarding minor drainage issues.
- Provide guidance on the importance of cleaning and maintaining gutters and drainage systems and the impact on mold and moisture issues in the home when the drainage systems are not maintained.

Electrical Issues

The two primary energy-related health and safety electrical concerns associated with *weatherization* work are insulating homes that contain knob-and-tube wiring and identifying overloaded electrical.

If no insulation is being installed in a home the existing fuses shall remain intact. In homes that utilize fuses where attic insulation is being installed the State Electrical Board recommends the use of a licensed electrician for the installation of safety fuses as indicated in the National Electrical Code.

S-Fuse Sizing

Type S fuses must be sized according to the smallest gauge of wire in the circuit to be protected. The following gauge wire requires the following size fuse:

<u>Wire Gauge</u>	<u>Fuse Size</u>
12 gauge wire	20 amp fuse
14 gauge wire	15 amp fuse

Wiring splices shall be enclosed in metal or plastic electrical boxes, fitted with cover plates. Electrical boxes in attics must be marked with a flag that is visible above the insulation.

General Information:

Knob-and-tube Wiring

- The State Electrical Board does not permit directly covering of knob-and-tube wiring with insulation.
- Knob-and-tube wiring in sidewalls shall not be covered by new insulation. If knob-and-tube wiring in walls is covered by existing insulation, additional insulation shall not be installed.
- Knob-and-tube wiring in attics shall not be directly covered with insulation. Attic insulation may be installed where the knob-and-tube wiring has been concealed in a hollow space that provides adequate ventilation space (a minimum of 3 ½" clearance) to alleviate overheating issues.
- If knob-and-tube wiring is covered by existing insulation, additional insulation shall not be installed until or unless the wiring has been located and concealed in a hollow space that provide ventilation space to alleviate overheating issues.
- Appropriate shielding materials for concealing the knob-and-tube wiring shall include 5/8" or thicker gypsum board, plywood or oriented strand board.
- Serious electrical hazards exist when gross overloads such as over usage, overloaded outlets and/or oversized fuses are present. Should *auditors* and crews find such existing problems, they should notify the owner and note the problem in the client file. *Weatherization* measures that involve the installation of new equipment such as air conditioners, heat pumps or electric water heaters can exacerbate previously marginal overload problems to hazardous levels. Rewiring of a home is outside the scope of the *weatherization* program.

Client Education:

- Provide information to the client on overloading circuits, electrical safety/risks.

Deferral Requirements:

- Homes with conditions that require more than incidental repair should be deferred.
- Voltage drop and voltage detection testing are not allowed.

Fire Hazards

Visual inspection is the primary mechanism for determining the fire hazard. Documentation of hazards should include notes of the visual inspection, diagrams of the visual inspection and photographs to support the visual inspection of the fire hazards.

General Information:

- Insulation shall not cover the pressure relief valve, end of the drip leg, draft hood, burner air inlet, pilot light access door, thermostat control, drain valve or the top of the water heater on natural gas or propane water heaters. Insulation shall not cover the pressure relief valve, end of the drip leg, high limit switch, or drain valve on electric water heaters.
- When adding additional insulation to the attic, shielding shall be installed around heat and high-heat sources. Shielding shall be metal and kept a minimum of 3" from any heat source and a minimum of 6" from a high-heat source. Shielding shall be installed at a height to accommodate the depth of the added insulation. If a masonry chimney has an existing metal or metal asbestos flue liner, the chimney does not need to be shielded.
- Weatherization materials shall not be installed over or adjacent to outlets, switches or junction boxes that contain aluminum wiring. Open wire splices shall not be covered with insulation until they have been enclosed with proper junction boxes.
- If potentially dangerous creosote buildup in chimneys or wood stoves is identified, up to \$500 may be spent to repair the unsafe solid fuel combustion heating system. Weatherization of the building envelope shall not proceed until the system has been made safe.
- Check for fire hazards in the home during the audit and while performing weatherization.
- Pipe wrap shall not be installed if the water heater lacks a pressure relief valve.
- Pipe wrap shall not begin within 2 inches or farther than 4 inches of a flue and/or draft hood.

Client Education:

- Inform client of observed hazards.

Formaldehyde, Volatile Organic Compounds (VOCs), and other Air Pollutants

Deferral Requirements:

- If pollutants pose a risk to workers the unit must be deferred.

Client Education:

- Inform client of observed condition and associated risks. Provide client written materials on safety and proper disposal of household pollutants.

Injury Prevention of Occupants and Weatherization Workers

Weatherization staff shall not work in unsafe and/or excessively unsanitary conditions. The personal health and safety of each client and employee is vitally important. Occupational Safety and Health Administration (OSHA) standards, Construction Trade Safety Standards, as well as company safety standards must be observed by everyone in the Nebraska Weatherization Program.

General Information:

- Workers must take all reasonable precautions against performing work on homes that will subject workers or occupants to health and safety risks.

Client Education:

- Inform client of the observed condition and associated risks.

Lead Based Paint

All dust is dangerous, but lead dust is particularly dangerous because lead is a poison.

Lead-Safe *Weatherization* (LSW) is a group of safe practices used by *weatherization* technicians when they suspect or confirm the presence of lead paint. LSW practices are simply rigorous dust-prevention and housekeeping precautions. Lead-safe *weatherization* is required when workers will disturb painted surfaces by cutting, scraping, drilling, or other dust-creating activities.

On April 10, 2010, the Environmental Protection Agency (EPA) "Lead; Renovation, Repair and Painting Program" (LRRPP) Final Rule became effective in the *Weatherization* Program. The Rule requires Certified Renovators to be onboard with *sub-grantee* crews or contractors, and performing all the EPA required functions on all pre-1978 housing.

The U.S. Department of Energy requires *sub-grantees* to follow specified EPA requirements.

General Information:

- Sub-grantees must follow both the EPA's Lead; Renovation, Repair and Painting Program (LRRPP) and the U.S. Department of Energy's Minimum Standards for Lead Safe *Weatherization*.
- Appropriate swab testing is allowed.
- Sub-grantees that complete work in homes where there is existing paint is "flaking" are responsible for the appropriate handling and cleaning the existing paint as well as any newly disturbed paint as part of jobsite cleaning. The costs associated with completing this work shall be included in the costs associated with the completion of the *weatherization* measure and the measure SIR. Sub-grantees may choose not to weatherize a *dwelling unit* if the extent and condition of lead-based paint would potentially create further health and safety hazards.
- Job site set up and cleaning verification is required to be completed by an EPA Certified Renovator.

Training Requirements:

- *Weatherization* requires all *weatherization* crews working in pre-1978 housing to be trained in Lead Safe *Weatherization* (LSW).
- Sub-grantees and all *weatherization* contractors are required to be trained on the requirements of the EPA Lead; Renovation, Repair and Painting Program.

Deferral Requirements:

- When the extent and condition of lead-based paint in the house would potentially create further health and safety hazards, the Sub-grantee will inform the client of the of the issues associated with a deferral in the *Weatherization* Deferral Notice completed by the *Weatherization* Representative and signed by the client or building owner.

Client Education:

- Inform client of observed conditions and associated risks.
- All LRRPP Client Protection and Notification processes must be followed.

Nebraska WAP Solutions to Alleviate Moisture Problems:

- Water moves easily as a liquid or vapor from the ground through porous building materials like concrete and wood. A high groundwater table can channel moisture into a home faster than anything short of a big roof leak. The most common ground-moisture source is water vapor rising through the soil or liquid water moving up through the soil by capillary action. To prevent this, all crawl spaces should have ground moisture barriers.
- Installing or improving air barriers and vapor barriers to prevent air leakage and vapor diffusion from transporting moisture into building cavities. See “Sealing Bypasses” on page 58.
- Adding insulation to the walls, floor, and ceiling of a home to keep the indoor surfaces warmer and less prone to *condensation*. During cold weather, well-insulated homes can tolerate higher *humidity* without *condensation* than can poorly insulated homes.

General Information:

- Sub-grantees must ensure that *weatherization* work is performed in a manner that does not contribute to mold problems, and when the work is performed properly, may alleviate mold conditions.
- Clothes dryers and exhaust fans shall be vented to the exterior.
- A full ground laid moisture barrier shall be installed in accessible crawl spaces and under mobile and modular homes.
- Mold testing is not an allowable cost.

Deferral Requirements:

- Where severe Mold and Moisture issues exist that pose a risk to workers, deferral is required. If serious mold conditions are discovered during the initial inspection of the home, the home should be referred to the appropriate public or non-profit agency for remedial action. *Weatherization* should not be undertaken until the problems have been alleviated. However, *weatherization* funds may be used to correct energy-related conditions to allow for effective *weatherization* work and/or to assure the immediate or future health of workers and clients.

Client Education:

- Sub-grantees must include some form of notification or disclaimer to the client upon the discovery of a mold condition. The notification should include what was or will be done to the house that is expected to alleviate the condition and/or that the work performed should not promote new mold growth. The notification must be signed by the client and the owner (if the client is a renter) and placed in the client file.

Occupant Pre-Existing or Potential Health Conditions

All products used in *Weatherization Services* must be approved by the U.S. Department of Energy. It is recognized that some products used may have an odor (Volatile Organic Compound or VOC) that some people may find objectionable or to which some people may experience sensitivity. If any family member or a *sub-grantee* believes that someone in the home may be hypersensitive to, or may otherwise object to the use in the home of any of the common commercial *weatherization* building materials, the issue must be documented and resolved prior to the start on the work,

General Information:

- When a person’s health may be at risk and/or the work activities could constitute a health or safety hazard, the occupant at risk will be required to take appropriate action based on severity of risk.
- Require occupant to reveal known or suspected health concerns as part of initial application for *weatherization*.
- Screen occupants during *audit* using the Health & Safety Client Home Screening Questionnaire.

Deferral Requirements:

- Failure or the inability to take appropriate actions must result in deferral.

Client Education:

- Provide client information of any known risks.
- Provide worker contact information so client can inform of any issues.

Pests	
General Information: <ul style="list-style-type: none"> Screening of windows and points of access is allowed to prevent intrusion 	Client Education: <ul style="list-style-type: none"> Inform client of observed condition and associated risks.
Deferral Requirements: <ul style="list-style-type: none"> Infestation of pests may be cause for deferral where it poses health and safety concern for workers. 	

Radon	
Radon is an odorless, tasteless and invisible gas produced by the decay of naturally occurring uranium in soil and water.	
General Information: <ul style="list-style-type: none"> In homes where radon may be present, precautions should be taken to reduce the likeliness of making radon issues worse. 	Client Education: <ul style="list-style-type: none"> Program requirements regarding the installation of vapor barriers in crawls spaces are included in the “<i>Foundation Insulation</i>” on page 81. Sub-grantees shall also provide clients with a Nebraska Radon Information Fact Sheet.

Refrigerants
Refrigerants are toxic to the heart and can result in heart attacks, high blood pressure and abnormal heart rhythms leading to circulatory collapse. Workers with potential exposure to refrigerants follow guidelines regarding awareness and personal protective equipment such as respiratory protection and chemical protective clothing.

General Information: <ul style="list-style-type: none"> Replaced air conditioners and heat pumps must be properly disposed of and the refrigerant reclaimed in compliance with the Clean Air Act 1990, section 608, as amended by 40 CFR 82, 5/14/93. The vendor, demanufacturing center or other entity recovering the refrigerant must possess EPA-approved Section 608 type I, II or III universal certification.
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Smoke, Carbon Monoxide Detectors, and Fire Extinguishers	
Action/Allowability <ul style="list-style-type: none"> Installation of CO detectors is an allowable Health & Safety Cost when detectors are not present or are inoperable. Replacement of operable CO Detectors is not an allowable cost. The costs associated with the installation of smoke detectors are not allowable Health & Safety Costs. The costs associated with providing fire extinguishers are not allowable Health & Safety Costs. 	Testing <ul style="list-style-type: none"> Check for operation of existing CO detectors.
Client Education <ul style="list-style-type: none"> Provide the client with verbal and written information on the use of CO detectors. 	Training <ul style="list-style-type: none"> Where to install detectors. Local code compliance.

Solid Fuel Heating	
Some people burn solid fuels such as wood, wood pellets or other solid fuel during the winter.	
General Information: <ul style="list-style-type: none"> Maintenance, repair and replacement of primary indoor heating units is allowed where occupant health and safety is concerned, with prior Energy Office approval. Maintenance and repair of secondary heating units is allowed. 	Client Education: <ul style="list-style-type: none"> Provide client with safety information.

Space Heaters

Space heaters are self-contained devices for heating an enclosed area. The two primary concerns associated with the use of space heaters are:

- the risk of fire, and
- in the case of gas, propane or kerosene heaters, the risk of *carbon monoxide* poisoning.

Electric Space Heaters

General Information:

- Repair, replacement or installation is not allowed.
- Removal is recommended.
- Check circuitry to ensure adequate power supply for existing space heaters.

Client Education:

- Inform client of hazards and collect a signed waiver if removal is not allowed.

Unvented Combustion Space Heaters

General Information:

- Removal is required, except as secondary heat where unit conforms to ANSI Z21.11.2.
- Units that do not meet ANSI Z21.11.2 must be removed prior to *weatherization* but may remain until a replacement *heating system* is in place.
- Testing for air-free *carbon monoxide (CO)* is allowed.
- Check units for ANSI Z21.11.2 label.

Client Education:

- Inform client of the dangers of unvented space heaters – *CO*, moisture, *NO2*, *CO* can be dangerous even if *CO* alarm does not sound.

Vented Combustion Space Heaters

General Information:

- Should be treated as furnaces.
- Venting should be tested consistent with furnaces.

Spray Polyurethane Foams (SPF)

There are many uses for spray polyurethane foam.

General Information:

- Use EPA recommendations when working within the *conditioned space* or when SPF fumes become evident within the *conditioned space*.
- When working outside the building envelope, isolate the area where foam will be applied, take precautions so that fumes will not transfer to inside *conditioned space* and exhaust fumes outside the home.
- Check for penetrations in the building envelope.

Client Education:

- Provide notification to the client of plans to use two-part foam and the precautions that may be necessary.

Ventilation	
<p>Action/Allowability</p> <ul style="list-style-type: none"> • Ventilation is an important health and safety concern in homes with unacceptable indoor air quality and one of the main strategies for dealing with the issue is mechanical ventilation. Pollution sources that contribute to unacceptable indoor air quality include but are not limited to: moisture, smoking, off-gassing of new carpets and furniture and a large number of inhabitants and/or pets. The Nebraska Weatherization Assistance Program requires subgrantees to comply with ASHRAE 62.2 requirements for ventilation and indoor air quality. The installation of new exhaust fans and related ducting, controls and passive air intakes, installed to comply with the requirements of ASHRAE 62.2 are allowable Health & Safety Costs. 	<p>Testing</p> <ul style="list-style-type: none"> • Subgrantees are required to ensure that existing ventilations systems are operable and to measure their ventilation performance and to verify that all ventilation systems are vented to the outdoors and not into building attics or crawlspaces. Pre- and post-weatherization blower door testing is required on all homes to verify the tightness of the home and to assist in calculating ASHRAE 62.2 ventilation air-flow requirements.
<p>Client Education</p> <ul style="list-style-type: none"> • Discuss and provide information on the function, use, and maintenance of the ventilation system and its components as applicable. Clients are also reminded of the importance and proper use of kitchen exhaust fans while cooking and bathroom exhaust fans. 	<p>Training</p> <ul style="list-style-type: none"> • Subgrantees will be trained in the proper implementation of ASHRAE 62.2 and all agency field staff must be proficient in the requirements of the standard. The costs incurred by subgrantees for ASHRAE 62.2 training, based on the WAP National Curriculum, is eligible for Training and Technical Assistance funding.

Window and Door Replacement, Window Guards	
<p>Action/Allowability</p> <ul style="list-style-type: none"> • Replacement, repair, or installation is not an allowable Health and Safety cost but may be allowed as an incidental repair or an energy efficiency measure if cost justified. 	<p>Testing</p> <ul style="list-style-type: none"> • Not applicable.
<p>Client Education</p> <ul style="list-style-type: none"> • Provide information on lead risks. 	<p>Training</p> <ul style="list-style-type: none"> • Awareness of guidance.

PROGRAM NOTES

Use of NEAT, MHEA and TREAT Audits NEAT, MHEA and TREAT audits determine what audit measures shall be implemented. The Weatherization Installation Measures and Work Standards determine how audit measures are to be implemented.

The audit measures mandated for use by all subgrantees in the NEAT, MHEA and TREAT audits shall be implemented only when the measure is called for by the audit. Audit measures with an individual SIR of 1.0 or greater shall be implemented. Audit measure with an SIR of less than 1.0 shall not be implemented.

The Weatherization Installation Measures and Work Standards contain weatherization measures in addition to the audit measures that are required to be implemented.

Any exception to the note above where undertaking the measure would subject workers to unreasonable health and/or safety hazards or cannot be completed shall be documented in the client's file.

Units Undergoing Remodeling - Units undergoing remodeling, or which have untreated remodeled areas that directly affect the weatherization process, shall not be weatherized. The client's application shall remain a part of the subgrantee's records until recertification is necessary. Weatherization of the unit may proceed if remodeling is completed to the standards of a completed dwelling unit and the client qualifies for the program at the time of that completion.

Material Standard - Only weatherization materials that are listed in the most current Appendix A - Standards of Weatherization Materials, 10 CFR Part 440, or meet or exceed the standards prescribed in Appendix A shall be installed as weatherization materials. Materials shall be installed according to state and local codes. Materials shall also be installed according to manufacturer's instructions unless specified by the State Plan.

Mobile Homes with Frame Additions - Mobile homes with frame additions shall have the additions weatherized as a site-built home.

Qualified Heating and/or Plumbing Contractor - To be considered qualified; a heating and/or plumbing technician/contractor must meet the following insurance requirements:

- A basic workers' compensation policy with a 30 day written notice of cancellation requirement; and
- A general liability policy including:
- Combined property damage liability coverage, bodily injury coverage and liability coverage at a minimum of \$300,000/\$500,000; and
- Products/completed operations hazard insurance.

All licenses, insurance, permits and warranties shall be the responsibility of the heating and/or plumbing contractor performing the work. The legal liability for performing the work rests with the heating and/or plumbing contractor performing the work.

AUDIT PARAMETERS

Site-Specific Energy Audit - A site specific audit shall be performed on all frame, masonry, modular and mobile homes. Homes with a cumulative SIR of less than 1 shall not be weatherized. Individual audit measures with an SIR of less than 1.0 shall not be implemented.

When performing the audits, subgrantees must use the most current version as authorized by the Nebraska Energy Office. A copy of the audit shall be retained in the clients' file.

Weather Data - Use local weather data when running site-specific audits.

Fuel Costs - Use average state fuel costs when running site-specific audits. When obtaining the cost of propane and electricity, use average annual fuel costs updated a minimum of every 12 months. The Nebraska Energy Office will provide updated fuel costs to subgrantees on an annual basis. This info is also available at www.neo.ne.gov

Material and Labor Costs - Use local material and labor costs when running site-specific audits. If subgrantees cannot use actual material and labor costs, use estimated material and labor costs updated a minimum of every 12 months.

Core Sampling – A minimum of 5% of all frame homes billed each month in which insulation is installed in an enclosed cavity shall be tested by the subgrantee for proper weight and density by taking a minimum of 2 core samples. The core samples shall be taken in random locations. In sidewalls, 1 core sample shall be taken within 3 feet of the top of the wall. The results of the core samples shall be recorded on the inspection form and retained in the client's file.

NEAT Candidate Measures – The following measures are mandated for use by all subgrantees:

1. R-11, R-19, R-30, R-38 and R-49 ceiling/attic insulation
2. Fill ceiling cavity
3. Sill box insulation
4. Foundation wall insulation
5. R-11, R-19 R-30 and R-38 floor insulation
6. Wall and kneewall insulation
7. Window sealing
8. Storm windows
9. Window replacement
10. Low E windows
11. Furnace tune up
12. High eff. furnace
13. High eff. boiler
14. AC tune up
15. AC replace
16. Install/replace heat pump
17. Lighting retrofits
18. Water heater tank and pipe insulation
19. Low flow shower heads
20. Water heater replacement

MHEA Candidate Measures – The following measures are mandated for use by all subgrantees:

1. General air sealing
2. Wall fiberglass batt, loose fill cellulose and fiberglass in Additions
3. Floor loose fill cellulose and fiberglass
4. Floor loose fill cellulose and fiberglass in Additions
5. Roof loose fill cellulose and fiberglass

6. Roof loose fill cellulose and fiberglass in Additions
7. Roof loose fill cellulose and fiberglass
8. Roof loose fill cellulose and fiberglass in Additions
9. Add skirting
10. Add skirting on Additions
11. Replace marked doors (mandatory)
12. Replace wooden doors
13. Replace wooden doors in Additions
14. Storm doors
15. Storm doors in Additions
16. Window sealing
17. Window sealing in Additions
18. Replace single paned windows
19. Replace single paned windows in Additions
20. Glass or Plastic storm windows
21. Glass or Plastic storm windows in Additions
22. Tune heating system
23. Tune cooling system
24. Replace dx cooling equipment
25. Lighting retrofits
26. Water heater tank and pipe insulation
27. Low flow shower heads
28. Water heater replacement
29. Replace heating system

Note: Blown fiberglass insulation is non-corrosive to metal skinned mobile homes and can achieve good R-values and convection resistance at lower densities and weights that won't cause damage to the interior sheeting or underbelly of the home. Installations that include cellulose insulation may be completed only after warrantee information is provided by the installer ensuring no future damage to either the ceiling or underbelly of the home as a result of the use of cellulose insulation.

Key Parameters and Default Parameters - The key parameters and default parameters shall be established by the Nebraska Energy Office and shall not be modified unless authorized.

Incidental Repair Costs – Incidental repair costs are those costs that are necessary for the installation or preservation of a weatherization measure.

- The costs of the incidental repairs must be included in the cumulative cost indicated in the Energy Audit and SIR calculation for the home.
- Repairs that can be classified as incidental to specific weatherization measures (i.e. attic, walls and floor insulation) should be charged to those measures if the inclusion does not make the implementation of the measure ineligible by reducing the individual SIR below 1.0.
- The incidental costs on a home shall not exceed \$500.

Multi-family Buildings - For energy audit purposes, DOE considers multi-family buildings to be those containing five dwelling units or more. Approved single-family energy audits can be used in buildings with up to four dwelling units. As approved by DOE on a case-by-case basis, certain single-family energy audits may be used in multi-family buildings containing up to 25 individually heated and cooled dwelling units. Common areas in -multi-family buildings may be weatherized like the closest unit.

INELIGIBLE MATERIALS/MEASURES

The following weatherization materials/measures shall not be installed:

1. Shade screens, rigid awnings, louver systems or window films;
2. Vestibules;
3. Automatic gas ignition systems;
4. Microcomputer burner controls;
5. Stack dampers on gas or oil-fueled water heaters;
6. Desuperheater/water heaters;
7. Energy recovery equipment;
8. Gas conversion power burners for gas or oil-fueled heating systems;
9. Reduce input of burner or derate gas-fueled equipment;
10. Vent dampers for gas or oil-fueled heating systems;
11. Reduce excess combustion air by reducing vent connector size of gas-fueled appliances;
12. Industrial-grade white paint used as a heat-reflective measure on awnings, window louvers, doors and exposed, exterior ductwork;
13. Liquefied petroleum gas storage;
14. Electric freeze-prevention tape for pipes;
15. Whole-house fans;

DEFINITIONS

A

-Accessible Attic. An attic with a minimum 24 inch clearance measured from the bottom of the top cord or ridge board to the top of the ceiling joists.

-Accessible Ductwork/Hydronic Pipes. Ductwork or hydronic pipes with a minimum twenty-four (24) inch clearance on a minimum of two (2) sides of the ductwork or hydronic pipes.

-Accessible Foundation. A foundation with a minimum 24 inch clearance measured from the bottom of the floor joist to the ground.

-Air Infiltration Barrier. A covering that will allow moisture out and not allow air into a space or wall cavity.

-Accessible Kneewalls. A kneewall with a minimum 36 inch clearance measured from the top of the floor joist to the bottom of the rafters and a minimum 36 inch clearance measured from the kneewall to the exterior wall.

B

-Basement. The bottom full height story of a building below the first floor. A basement may be partially or completely below grade.

C

-Certified Weatherization Staff. A subgrantee staff person who has successfully completed the Nebraska Energy Office certification requirements to perform a task in the weatherization program.

- cfm50. Cubic feet per minute of airflow at a 50 Pascal pressure difference between the interior and exterior of a structure.

-Conditioned. A space that contains a source intended specifically to heat or cool that space.

-Crawl Space. A space below the first floor that is less than full story height. Ledge basements where the ledge is 6 feet or more from the front to the back are to be considered a crawl space.

D

- Distribution System. The enclosed pathway for conditioned air to travel to and from the heating/cooling plant. It shall include but is not limited to the metal or fiber duct, panned floor cavity, designated wall cavity and the point where funnels and boots meet the wall or floor.

- Disabled/Inoperable Heating Plants. Heating plants that have had the fuel source disconnected and/or capped and the flue disconnected.

E

-Eligible Heating Plant. A furnace or boiler that utilizes natural gas, propane, fuel oil or electricity as the fuel/energy source. Eligible heating plants include forced air, gravity, wall, floor, electric baseboard, mobile home furnaces, heat pumps and boilers. Gravity furnaces that have been retrofitted with a blower or that have been converted from one fuel source or another are also eligible.

-Exposed Floors. A floor that is in direct contact with the outside air. Examples are cantilevers, the floors of bay or bow windows, garage ceilings, etc.

H

- Heating Plant. A boiler or furnace, not including the flue, fuel piping, thermostat, distribution system, etc.

- Heating System. A heating plant and the associated connections necessary for operation including, but not limited to, the flue, fuel piping, thermostat, distribution system, etc. This also includes the water heater, flue and fuel line.

-Heat Source Type-B vent, masonry chimneys that vent natural gas or propane and exhaust fans.

- High Heat Source. Heat produced through the combustion process by solid fuel and/or fuel oil combustion appliances. Recessed lighting is also considered a high-heat source.

-Hydronic pipes. Piping system used to distribute water or steam to and from water boilers or steam boilers.

I

-Inaccessible Underbellies. A mobile home underbelly with less than 24 inches clearance, measured from the weatherboard to the ground at the area to be weatherized.

K

-Kneewall. A vertical wall between an attic and a conditioned space.

L

-Ledged Basement. A basement constructed with a concrete or dirt ledge less than 6 feet front to back around the perimeter of the foundation. The ledge may be only around a portion of the foundation wall. Ledges more than 6 feet front to back are considered a crawl space.

-Living area. An area within the conditioned envelope that is used on a regular basis for sleeping, eating, bathing etc.

N

-(n) factor. A procedure for estimating natural air-leakage from measured blower door readings. See page 16

P

-Pressure Treated. Lumber that has been commercially treated under pressure with a wood preservative to prevent damage from moisture, insects, fungi and other forms of biological decay.

Q

-Qualified Heating Technician. An individual or company that is specifically involved in the installation and/or servicing of residential heating/ cooling systems.

S

- SIR (Savings to Investment Ratio). A ratio of economic performance as calculated by NEAT MHEA and TREAT audits. An SIR of 1 indicates the weatherization measure will pay for itself one time during its life.

- Spray-applied insulation. Insulation manufactured specifically to be spray-applied.

- Safety Inspection An inspection performed by a qualified heating technician, a natural gas utility, a propane supplier or certified weatherization staff.

T

-Tube-fill method. An insulation technique developed to install high density blown insulation in enclosed cavities.

-Type S Fuse. A non-removable adapter that is screwed into the fuse socket permitting only one size fuse to be installed.

U

-Unconditioned. An area having no source of heating or cooling.

-Under-cut. To cut the bottom of an interior door to allow return air to flow from that area to the furnace compartment or common return.

-Unsafe water heater. A unit that 1) has been red tagged by a utility company/supplier or a building code jurisdiction, 2) shows visual signs of deterioration such as scorch marks indicating past backdrafting occurrences 3) shows signs of compromised water tank integrity as evidenced by signs of leakage 4) when tested exceeds 100-ppm as measured in the flue gases or 0-ppm in the ambient air and the CO levels cannot be reduced..

-Unvented Combustion Space Heater. An unvented heating unit intended to supply heat to a small area.

W

-Weatherboard. A covering consisting of a minimum 30 pound felt paper, exterior grade plywood, fiberboard, an air infiltration barrier or a material specifically manufactured as mobile home weatherboard installed on the underside of a mobile home to support and protect the floor insulation.

CHARTS AND TABLES

The following table shall be used to determine the R-value of existing insulation:

<u>Loose/Blown</u>	<u>R-value per inch</u>	<u>Batt/Blanket</u>	<u>R-value per inch</u>
Fiberglass	R-2.2 per inch	Fiberglass	R-3.1 per inch
Rock Wool	R-2.9 per inch	Rock Wool	R-3.4 per inch
Cellulose	R-3.7 per inch		
Perlite	R-2.5 per inch	<u>Rigid</u>	<u>R-value per inch</u>
Vermiculite	R-2.2 per inch	Isocyanurate	R-7.0 per inch
Other	R-3.1 per inch	Polystyrene	R-3.2 per inch
Zero-Expanding Foam	R-4.2 per inch		

The following table shall be used to determine the net free vent area for existing vents:

<u>Roof Vent</u>	<u>Net Free Vent Area</u>	<u>Soffit Vent</u>	<u>Net Free Vent Area</u>
8" diameter	50 square inches	4" x 16"	32 square inches
9" diameter	60 square inches	8" x 16"	64 square inches
9.5" diameter	70 square inches	4" x 8"	16 square inches
10" diameter	80 square inches		
13.5" diameter	144 square inches		
Turbine	239 square inches		

<u>Rectangular</u>	<u>Net Free Vent Area</u>	<u>Triangular</u>	<u>Net Free Vent Area</u>
<u>Gable Vent</u>		<u>Gable Vent</u>	
8" x 12"	48 square inches	30" base	82 square inches
12" x 18"	108 square inches	48" base	144 square inches
14" x 24"	168 square inches	72" base	197 square inches
18" x 24"	216 square inches		
24" x 30"	360 square inches		

The net free vent area for other size rectangular vents may be determined by using the following:

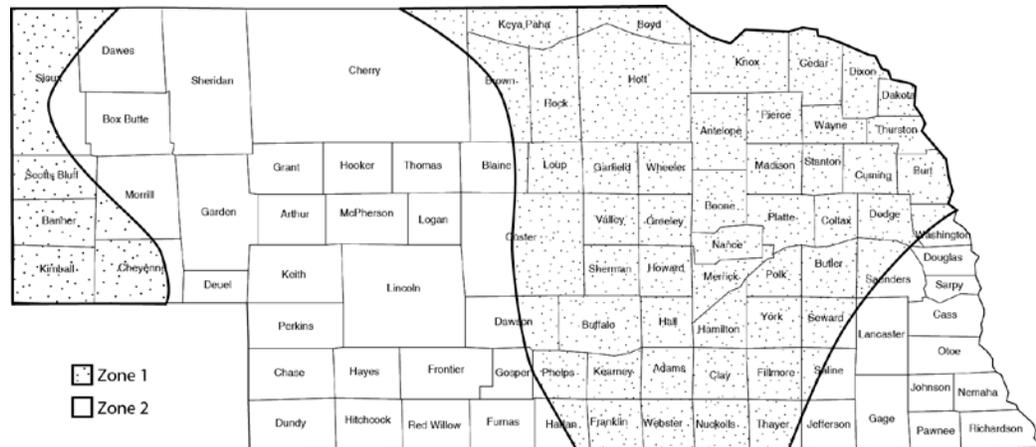
Net Free Inches = (Width x Height) divided by 2

The net free vent area for other size triangular vents may be determined using the following:

Net Free Inches = (Width x Height) divided by 4

Nebraska Building Tightness Limit

Step 1: Find the homes climate zone on the Nebraska map.



Step 2: Match that Zone number with the same Zone number on the table.

n Factor Table					
Zone ↓	# of stories →	1	1.5	2	3
1	Well Shielded	18.6	16.7	14.9	13.0
	Normal	15.5	14.0	12.4	10.9
	Exposed	14.0	12.6	11.2	9.8
2	Well Shielded	22.2	20.0	17.8	15.5
	Normal	18.5	16.7	14.8	13.0
	Exposed	16.7	15.0	13.3	11.7

Step 3: Identify your site as well-shielded, normal or exposed.

Wind Shielding Factors	
Well Shielded -	Urban areas with high buildings or sheltered areas. Buildings surrounded by trees, bermed earth, or higher terrain.
Normal -	Buildings in a residential neighborhood or subdivision setting, with yard space between buildings. 80-90% of houses fall in this category.
Exposed -	Buildings in an open setting with few buildings or trees around. Buildings on top of a high hill or ocean front, exposed to winds.

Step 4: Identify the column for your building’s number of stories. Since there is little infiltration except through the top portion of basements, generally they should not be included in the number of stories. In the case of walkout basements a .5 should be added to the number of stories.

Step 5: Follow that column down to where it meets the row corresponding to your climate zone and shielding to find the home’s *n* factor.

Step 6: Find the Building Tightness Limit (BTL), using the formula listed below:

$$\text{BTL}(\text{cfm50 minimum}) = \text{Whichever of the following is greater } (\# \text{ of occupants or } [\text{the } \# \text{ of bedrooms} + 1]) + (\text{the } \# \text{ of naturally aspirating appliances that get combustion air from inside the building envelope}) \times (\textit{n} \text{ factor}) \times 15 \text{cfm}$$

- Consider adding another occupant or two for each person in the home that smokes.
- Regardless of the calculated limits, air sealing shall not be undertaken if the house has an indoor air quality problem that has not been fixed or cannot be remedied.

If Required

Step 7: Install Continuous Ventilation as per the following table if a home's pre- and/or post-infiltration blower door test CFMs are lower than the calculated BTL for the home.

Continuous Ventilation

Ventilation Air Requirements, CFM					
Floor Area	Bedrooms				
(ft ²)	0-1	2-3	4-5	6-7	>7
<1500	30	45	60	75	90
1501-3000	45	60	75	90	105
3001-4500	60	75	90	105	120
4501-6000	75	90	105	120	135
6001-7500	90	105	120	135	150
>7500	105	120	135	150	165

Table is a duplicate of Table 4.1a (I-P) for Minimum Ventilation from the ANSI/ASHRAE Standard 62.2 – 2010 for Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings.

HEALTH AND SAFETY

1) SAFETY INSPECTION

Prior to weatherizing the building envelope, all eligible heating plants over two (2) years of age that have not received a safety inspection during the twelve (12) months prior to the initial inspection shall be inspected by a qualified heating technician, utility company or certified weatherization staff.

Definitions:

-Certified Weatherization Staff. A subgrantee staff person who has successfully completed the Nebraska Energy Office certification requirements to perform a task in the weatherization program.

-Eligible Heating Plant. A furnace or boiler that utilizes natural gas, propane, fuel oil or electricity as the fuel source. Eligible heating plants include forced air, gravity, wall, floor, electric baseboard, mobile home furnaces, heat pumps and boilers. Gravity furnaces that have been retrofitted with a blower or that have been converted from one fuel source or another are also eligible.

-Qualified Heating Technician. An individual or company that is specifically involved in the installation and/or servicing of residential heating systems.

- Heating Plant. A boiler or furnace, not including the flue, fuel piping, thermostat, distribution system, etc.

- Heating System. A heating plant and the associated connections necessary for operation including, but not limited to, the flue, fuel piping, thermostat, distribution system, etc. This also includes the water heater, flue and fuel line.

- Safety Inspection An inspection performed by a qualified heating technician, a natural gas utility, a propane supplier or certified weatherization staff.

If the safety inspection was performed by a qualified heating technician, the need for replacement shall be confirmed by a utility company, a second qualified heating technician or certified weatherization staff.

The building envelope shall not be weatherized if the owner or client refuses a safety inspection of the heating system or until any heating system deficiency has been repaired and/or the heating plant replaced.

Propane gas detectors shall be installed according to manufactures instructions in homes that have propane combustion appliances.

Inspection Requirements

The safety inspection shall include all of the following that apply to the heating and/or water heating system being inspected:

- 1-a) Conduct a leakage test of the appliance piping and control system downstream of the shutoff valve in the supply line to the appliance.
- 1-b) Visually inspect the venting system for proper size and horizontal pitch and determine that there is not blockage or restriction, leakage, corrosion or other deficiencies that could cause an unsafe condition.
- 1-c) Inspect burners and crossovers for blockage and corrosion.
- 1-d) Determine that the pilot is burning properly and that main burner ignition is satisfactory.
- 1-e) Test the pilot safety device to determine that it is operating properly.
- 1-f) Visually determine that main burner gas is burning properly.
- 1-g) If the appliance is equipped with a high and low flame control or flame modulator, check for proper main burner operation at low flame.
- 1-h) Test for spillage at the draft hood relief opening.
- 1-i) On furnaces and console heaters, test the heat exchanger for cracks and openings and visually inspect the heat exchanger for excessive corrosion.
- 1-j) On furnaces and console heaters, check the fan control for proper operation.
- 1-k) Determine that water heaters have a pilot access door, pressure relief valve and draft hood.
- 1-l) On water heaters and boilers, inspect for evidence of water or combustion product leaks.
- 1-m) On boilers, determine that the water pumps and automatic controls are in operating condition.
- 1-n) If accessible, inspect the central air conditioner coils.
- 1-o) Check the fan and belt condition.
- 1-p) Inspect for exposed wiring.
- 1-q) The gas detectors shall be 110 volt and permanently installed.

<p>2) COMBUSTION APPLIANCE BACKDRAFT TEST</p> <p>A backdraft test shall be performed on all vented, naturally drafting combustion appliances at the time of the initial and quality control inspections.</p> <p>A backdraft test shall not be performed on solid fuel burning appliances.</p>	<p style="text-align: center;">Backdraft Testing Requirements</p> <p>The backdraft test shall be conducted in the following manner:</p> <p>NOTE: For appliances that share a common flue, test the smallest BTU appliance first. Place into operation the next largest appliance and test that one. Then perform a test with all appliances operating simultaneously.</p> <ul style="list-style-type: none"> 2-a) Close all exterior windows and doors. If the combustion appliance/appliances are in a basement, crawl space or mechanical room, close the door to the basement, crawlspace or mechanical room. 2-b) Place all appliances and exhaust equipment that are vented to the outside of the heated envelope into operation. 2-c) Visually determine that main burner gas is burning properly: i.e., no floating, lifting or flashback. 2-d) Test for spillage at the draft hood relief opening after 5 minutes of main burner operation.
<p>3) CARBON MONOXIDE</p> <p>A carbon monoxide (CO) test shall be performed on all naturally drafting combustion appliances, including cooking stoves, at the time of the initial and quality control inspections.</p> <p>CO tests shall not be performed on solid fuel burning appliances.</p> <p>CO alarms shall be installed whenever a combustion appliance is present.</p>	<p style="text-align: center;">CO Testing Requirements</p> <p>The CO (carbon monoxide) test shall be conducted in the following manner:</p> <ul style="list-style-type: none"> 3-a) Close all exterior windows and doors. If the combustion appliance / appliances are in a basement, crawl space or mechanical room, close the door to the basement, crawlspace or mechanical room. 3-b) Place the appliance in operation and after 5 minutes, test for CO in the undiluted flue gases. This is known as “as measured.” 3-c) If CO levels exceed 100 PPM as measured in the undiluted flue gases the Qualified Heating Technician shall complete a tune and clean of the appliance to reduce the CO levels. 3-d) CO alarms shall be installed according to manufacturer’s instructions.

<p>4) REPLACE HEATING PLANT</p> <p>Eligible unsafe heating plants in frame, masonry and modular homes that cannot be repaired, as determined by a Qualified Heating Technician, shall be replaced.</p> <p>Units that contain heating plants that are inoperable or red-tagged at the time of the initial inspection shall not be weatherized until the heating plant has been repaired or replaced.</p> <p>With Nebraska Energy Office approval, multiple heating plants or motorized dampers may be installed to provide zone heating.</p> <p>Unsafe space heaters may be replaced with a forced air system.</p> <p>With Nebraska Energy Office approval, the heating plant may utilize a new fuel source.</p> <p>A service label must be installed on replacement combustion appliances and those that have had repairs or have been tuned and cleaned.</p> <p><u>Mobile Home specific measures</u></p> <p>Eligible unsafe heating plants in mobile homes that cannot be repaired shall be replaced.</p> <p>Mobile homes heated by naturally drafting combustion heating systems that are not specifically manufactured for use in mobile homes shall not be weatherized until the heating system has been replaced with a heating system designed for use in mobile homes.</p> <p>Mobile homes that are designed to use the underbelly area as return air shall have, with client permission, all the return registers blocked and sealed.</p>	<p style="text-align: center;">General</p> <p>4-a) Forced air furnaces shall have a minimum AFUE of 90 percent, boilers a minimum of 85 percent and wall and console heaters, a minimum of 80 percent.</p> <p>4-b) Efficiency ratings for forced air furnaces and boilers must be listed in the most current edition of the Gas Appliance Manufacturers Association (GAMA) Consumer’s Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment.</p> <p>4-c) Heat exchangers in all replacement heating plants shall have a minimum 10 year manufacturer’s warranty.</p> <p>4-d) The replacement heating plant shall be competitively bid and properly sized using the post-weatherization characteristics of the home.</p> <p>4-e) The service label shall be placed on or near the heating plant containing the name, business address and phone number of the company or agency performing the work, any repairs that were completed and the date the work was performed.</p> <p><u>Mobile Home specific work standards</u></p> <p>4-f) Forced air furnaces shall have a minimum AFUE of 90 percent, or be the highest efficiency practical.</p> <p>4-g) The replacement heating plant shall be specifically manufactured for use in mobile homes and be comparable with the BTU out-put of the replaced unit.</p> <p>4-h) If the connection between the new furnace and the trunk line will not be accessible after installation, the heating contractor shall seal the connection.</p> <p style="text-align: center;">Venting and Ductwork</p> <p>4-i) The replacement heating plant shall use the existing distribution system.</p> <p>4-j) New ductwork or hydronic pipes may be installed to properly balance the system. Flexible ductwork shall be no more than 4 lineal feet per run if possible.</p> <p>4-k) The replacement heating plant shall be properly vented and use outside air for combustion if the unit will accept dedicated combustion air.</p> <p>4-l) If the replacement heating plant is installed with</p>

Air conditioner evaporator coils of operable air conditioning units shall be replaced if they will not fit the new heating plant.

Drip pans in poor condition may be replaced.

existing central air conditioning, the air conditioner evaporator coil should be a cased coil or be raised and made accessible for periodic service and cleaning.

- 4-m)** The condensate line shall not be drained to the exterior of the home.
- 4-n)** If a new forced-air furnace or boiler is installed that will not be vented through the masonry chimney but the water heater will still be vented through that chimney, a properly sized flue liner shall be installed.
- 4-o)** As an alternative, a power vent may be installed on the water heater.
- 4-p)** Furnace filter racks on new heating systems shall be installed in an area that is convenient and conducive for the customer to access.

Thermostat

- 4-q)** The thermostat shall be calibrated and adjusted and any operable accessories that were installed on the existing heating system shall be removed and reinstalled on the new heating system, if possible. If a new thermostat is installed, the wire hole in the wall behind the thermostat shall be sealed.

Mobile Home specific work standards

- 4-r)** The combustion air sleeves and air conditioner condensates to the underbelly shall not be covered.
- 4-s)** When the return air system is blocked and sealed a minimum 16 inch x 24 inch vent shall be installed in the furnace compartment door.
- 4-t)** If the vent is not installed, the mobile home floor shall be not be insulated.
- 4-u)** Interior doors may need to be under-cut to provide adequate return air to the furnace.

Definitions:

-Under-cut. To cut the bottom of an interior door to allow return air to flow from that area to the furnace compartment or common return.

- 4-v)** All fuel-burning, heat-producing appliances except ranges and ovens, shall be vented to outside.
- 4-w)** All fuel-burning appliances, (except ranges, ovens, illuminating appliances and clothes dryers,) solid fuel-burning fireplaces and solid fuel-burning fireplace stoves, must be installed to provide for the complete separation of the combustion system from the interior atmosphere of the manufactured home (i.e., to draw their

<p>Unvented combustion space heaters are not an eligible heating system and shall not be replaced with new unvented combustion space heaters.</p> <p>Existing unvented combustion space heaters may remain as secondary heat sources.</p>	<p style="color: red;">combustion air from outside).</p> <p>4-x) Unvented gas- and liquid-fueled space heaters that remain in a completed single-family house after weatherization shall not have an input rating in excess of 40,000 Btu/hour and shall not be located in, or obtain combustion air from sleeping rooms or storage closets.</p> <p>Note: See Health and Safety pages 1 through 6 for more details.</p>
<p>5) HEATING PLANT TUNE AND CLEAN</p> <p>A tune and clean may be performed on eligible heating plants.</p>	<p style="text-align: center;">Tune and Clean</p> <p>The tune-up and cleaning shall be conducted in the following manner:</p> <p>5-a) Lubricate all moving parts.</p> <p>5-b) Calibrate and adjust the thermostat.</p> <p>5-c) Clean or replace the furnace filter.</p> <p>5-d) Adjust the conditioned air flow, high limit control, fan control and temperature rise.</p> <p>5-e) Clean and adjust the burners.</p> <p>5-f) Remove and clean the blower.</p> <p>5-g) Clean and vacuum the return air and furnace cabinet, filter rack, exhaust port and draft hood.</p> <p>5-h) Clean the heat exchanger.</p> <p>5-i) Adjust the belt tension or replace the belt.</p> <p>5-j) On frame homes, seal the thermostat wire penetration.</p> <p>5-k) Test the furnace for CO and adjust or repair the furnace.</p> <p>5-l) Test the heating elements and sequencers on electric units.</p> <p>5-m) Inspect the interior and exterior wiring inside the cabinet on electric units.</p> <p>5-n) If accessible, inspect and clean the central air conditioner coils.</p>

6) REPAIR HEATING PLANT

In owner occupied homes, if the material and labor to correct deficiencies in eligible heating plants exceeds \$500, the unit shall be replaced. However, unique situations may be dealt with on a case by case basis.

In renter occupied homes, if the material and labor to correct deficiencies in eligible heating plants exceeds \$400, the owner shall repair or replace the heating plant. However, if replacement is made in accordance with the requirements of these installation standards, the Weatherization Assistance Program may contribute a maximum of \$500, for the replacement of the heating plant and flue liner, if one is necessary.

Weatherization of the building envelope shall not proceed until the unit has been repaired or replaced.

A maximum of \$500 may be spent to repair unsafe solid fuel combustion heating systems.

If a dwelling is heated by *unvented combustion space heaters* and an inoperable eligible heating system is present, the eligible heating system shall be repaired or replaced to eliminate the need for unvented space heaters.

Definitions:

-Unvented Combustion Space Heater. An unvented heating unit intended to supply heat to a small area.

If the need for unvented combustion space heaters cannot be eliminated, the subgrantee shall instruct the client regarding the dangers of carbon monoxide and excessive moisture levels, particularly if any unvented space heaters are left in the dwelling as a secondary heat source, or emergency back-up.

General

6-a) All repairs shall be performed by a qualified heating technician or utility company.

<p>7) REPAIR CENTRAL AIR CONDITIONER</p> <p>Air conditioner evaporator coils of operable units shall be replaced if they will not fit the new heating plant.</p> <p>Drip pans in poor condition may be replaced.</p> <p>A maximum \$500 may be spent to repair heat pumps and central air conditioners.</p> <p>In renter occupied homes, if the cost to repair the central air conditioner or heat pump exceeds \$500, the owner may repair or replace the unit. However, if the central air conditioner or heat pump is replaced in accordance with the requirements of these installation standards the Weatherization Assistance Program may contribute a maximum of \$500.</p> <p>Replacement heat pumps and central air conditioners may not be charged to the health and safety line item.</p>	<p style="text-align: center;">General</p> <p>7-a) Replacement central air conditioners shall be a minimum 14-SEER (Seasonal Energy Efficiency Factor) and use environmentally friendly Freon.</p> <p>7-b) Replacement heat pumps shall be a minimum 14-SEER and 8.2-HSPF (Heating Seasonal Performance Factor) and use environmentally friendly Freon. Heat pumps must be installed with ramp-up type thermostats especially designed to bring backup heat in stages, and only when the heat pump can no longer keep up with demand, and must be able to differentiate between a demand call and a 'return from setback' call for heat.</p> <p>7-c) The replacement central air conditioner or heat pump shall be properly sized using the post-weatherization characteristics of the home.</p> <p>7-d) Replacement central air conditioners and heat pumps shall be replaced by a Qualified Heating Technician.</p> <p>7-e) A service label shall be placed on or near the furnace plenum containing the name, business address and phone number of the company or agency performing the work, any repairs that were completed and the date the work was performed.</p>
<p>8) WATER HEATERS</p> <p>Existing unvented gas water heaters shall be vented to the exterior.</p> <p>Unsafe water heaters that cannot be repaired shall be replaced.</p> <p>With Nebraska Energy Office approval, replacement water heaters may utilize a new fuel source.</p> <p>Missing or damaged drip legs shall be replaced as per local, state and national codes and be plumbed within 6 inches of the floor.</p> <p>A maximum of \$250 in material and labor may be spent to correct deficiencies in water heaters. If the material and labor exceeds \$250, the unit shall be replaced in owner occupied homes.</p> <p>In renter occupied homes, the owner shall repair or replace the water heater. If replacement is</p>	<p style="text-align: center;">General</p> <p>8-a) New gas water heaters shall have a minimum efficiency of .60 and new electric water heaters shall have a minimum efficiency of .91.</p> <p>8-b) All repairs and replacements shall be performed by a qualified heating or plumbing technician or utility company.</p> <p><u>Mobile Home specific work standards</u></p> <p>8-c) Replacement gas water heaters in mobile homes shall be specifically designed as mobile home water heaters.</p> <p>8-d) A service label shall be placed on or near the water heater containing the name, business address and phone number of the company or agency performing the work, any repairs that were completed and the date the work was performed.</p>

<p>made in accordance to these installation standards the Weatherization Assistance Program may contribute a maximum of \$150.</p> <p>Weatherization of the building shall not proceed until the water heater has been repaired or replaced.</p>	
<p>9) CLOTHES DRYERS</p> <p>Existing unvented clothes dryers shall be vented to the exterior.</p> <p><u>Mobile Home specific measures</u></p> <p>Existing unvented clothes dryers shall be vented to the exterior and through the skirting.</p>	<p style="text-align: center;">Dryer Venting</p> <p>9-a) Dryer vent pipe should not be installed with sheet metal screws, rivets or other intrusive fasteners that will collect lint.</p> <p>9-b) Acceptable fasteners include clamps, straps and duct mastic with mesh tape.</p> <p>9-c) Dryer vent pipe shall be metal and the termination cap shall be dampered and attached with rust proof fasteners.</p> <p>9-d) Dryer vent ductwork shall be smooth surfaced and whenever possible, not exceed 14 feet in length.</p> <p>9-e) No more than two 90 degree elbows may be used in the vent system.</p> <p>9-f) Relocation of dryers may need to be considered to meet this vent pipe length limitation.</p> <p>9-g) Flexible metal vent pipe may be used if it does not exceed 8 feet in length. The dryer vent pipe shall not be installed with sheet metal screws, rivets or other intrusive fasteners that will collect lint.</p>
<p>10) EXHAUST FANS</p> <p>Kitchen and bathroom exhaust fans shall be vented to the exterior whenever possible.</p>	<p style="text-align: center;">Exhaust Fan Venting</p> <p>10-a) Exhaust vent pipe shall be fastened at all connections with sheet metal screws or rivets.</p> <p>10-b) Horizontal runs and elbows should be avoided.</p> <p>10-c) If the exhaust vent is terminated through the soffit, caution must be taken to avoid moisture collecting in the vent pipe.</p> <p>10-d) When vented to the exterior, the exhaust vent pipe shall be metal and the termination cap shall be dampered and attached with rust proof fasteners.</p>

11) ELECTRICAL

Knob-and-tube Wiring – The State Electrical Board does not permit the covering of knob-and-tube wiring with cellulose insulation. Knob-and-tube wiring in sidewalls shall not be covered by new insulation.. If knob-and-tube wiring is covered by existing insulation, additional insulation shall not be installed.. Knob-and-tube wiring in attics shall not be directly covered with insulation. Attic insulation may be installed where the knob-and-tube wiring has been concealed in a hollow space that provides adequate ventilation space to alleviate overheating issues. If knob-and-tube wiring is covered by existing insulation, additional insulation shall not be installed until or unless the wiring has been located and concealed in a hollow space that provide ventilation space to alleviate overheating issues.

S-Fuses

If no insulation is being installed in a home the existing fuses shall remain intact. In homes that utilize fuses where attic insulation is being installed the State Electrical Board recommends the use of a licensed electrician for the installation of safety fuses as indicated in the National Electrical Code.

S-Fuse Sizing

11-a) Type S fuses must be sized according to the smallest gauge of wire in the circuit to be protected. The following gauge wire requires the following size fuse:

<u>Wire Gauge</u>	<u>Fuse Size</u>
12 gauge wire	20 amp fuse
14 gauge wire	15 amp fuse

12) SHIELDING

When adding additional insulation to the attic, shielding shall be installed around heat and high-heat sources.

General

- 12-a)** Shielding shall be metal and kept a minimum of 3 inches from any heat source and a minimum of 6 inches from a high-heat source.
- 12-b)** Shielding shall be installed at a height to accommodate the depth of the added insulation.
- 12-c)** If a masonry chimney has an existing metal or metal asbestos flue liner, the chimney does not need to be shielded.

Mobile Home specific work standards

- 12-d)** If a mobile home has a double sleeve flue, the chimney does not need to be shielded.

<p>13) MOISTURE BARRIER</p> <p>A full ground laid moisture barrier shall be installed whenever possible in accessible crawlspaces except when one is existing or the space has a concrete floor.</p>	<p style="text-align: center;">General</p> <p>13-a) The moisture barrier shall be a minimum 6-mil polyethylene and extend up the walls and the support columns at least 12 inches and the joints shall overlap a minimum of 12 inches.</p> <p>13-b) In the event the entire floor cannot be covered, all accessible areas shall receive a moisture barrier.</p> <p>13-c) When installing insulated skirting without adequate clearance to install a full ground laid moisture barrier, the moisture barrier shall extend a minimum of 24 inches beyond the insulation.</p>
<p>14) SIDING REMOVAL</p> <p>Slate siding that may contain asbestos may be removed as long as the siding material does not become friable.</p>	<p style="text-align: center;">General</p> <p>14-a) Removal shall comply with federal, state and local regulations.</p>
<p>15) FIBERGLASS INSULATION</p> <p>Fiberglass batt insulation installed in a <i>living area</i> shall be covered with paneling, plywood, chipboard, hardboard or drywall, with the exception of sill box insulation.</p> <p>Definitions:</p> <p>-<u>Living area</u>. An area within the conditioned envelope that is used on a regular basis for sleeping, eating, bathing etc.</p>	<p>15-a) If the covering is drywall, the drywall shall be taped and receive 1 coat of joint compound.</p> <p>15-b) If plywood, chipboard or hardboard is installed, the joints shall be caulked.</p> <p>15-c) If paneling is installed, the paneling shall be a minimum 3/16 inch and the joints shall be caulked.</p> <p>15-d) The vapor barrier on sill box insulation shall completely cover the insulation to prevent fibers from entering the basement.</p>
<p>16) BLOWER DOOR TEST</p> <p>A pre-infiltration and post-infiltration blower door test shall be performed to determine the building tightness of the home.</p> <p>If using the blower door would compromise the health and safety of the occupants of the home or the agency staff, crews or contractors, the blower door tests and air sealing shall not be done.</p>	<p style="text-align: center;">BTL (Building Tightness Limit)</p> <p>16-a) The building tightness limit (BTL) or minimum cfm50 for any structure shall be calculated as follows:</p> <p style="padding-left: 40px;">BTL(cfm50 minimum) = Whichever of the following is greater (# of occupants or [the # of bedrooms +1]) + (the # of naturally aspirating appliances that get combustion air from inside the building envelope) x <u>(n) factor x 15cfm.</u></p> <p>Definitions:</p> <p><u>(n) factor</u>. A procedure for estimating natural air-leakage from measured blower door readings. See page 16.</p>

GENERAL HEAT LOSS

17) MECHANICAL SYSTEMS

Accessible openings, tears and joints in the distribution system shall be sealed.

Uninsulated, accessible distribution systems located in spaces intended to be unconditioned shall be sealed and insulated.

Definitions:

- Distribution System. The enclosed pathway for conditioned air to travel to and from the heating/cooling plant. It shall include but is not limited to the metal or fiber duct, panned floor cavity, designated wall cavity and the point where funnels and boots meet the wall or floor.

- Accessible Ductwork/Hydronic Pipes. Ductwork or hydronic pipes with a minimum twenty-four (24) inch clearance on a minimum of two (2) sides of the ductwork or hydronic pipes.

All misaligned or disconnected ductwork and floor registers shall be realigned or reattached using sheet metal screws.

Missing or damaged ductwork and floor registers shall be replaced and sealed.

Fiberglass duct liner insulation shall not be installed.

Disposable furnace filters may be replaced.

Furnace filter racks may be moved and/or installed in an area that is convenient and conducive for the customer to access.

Programmable thermostats may be installed.

Mercury thermostats may be replaced with digital thermostats.

Switchplate thermometers may be installed.

Plenums adjacent to high heat sources shall not be insulated.

Definition:

- High Heat Source. Heat produced through the combustion process by solid fuel and/or fuel oil combustion appliances. Recessed lighting is also considered a high-heat source.

Accessible Hydronic pipes located in spaces intended to be unconditioned shall be insulated.

Definition:

- Hydronic pipes. Piping system used to distribute water or steam to and

Duct Sealing

- 17-a)** Tears and joints shall be sealed using nontoxic and water-resistant mastic.
- 17-b)** Mesh tape shall be used when openings and tears are over 1/16 of an inch.
- 17-c)** Butyl tape may be used when the installation of mastic is not feasible.
- 17-d)** The butyl tape shall have a minimum 2 mil aluminum backing and a minimum 15 mil adhesive.

Duct Insulation

- 17-e)** Ductwork shall be insulated with a minimum R-8 insulation secured with cord, wire, plastic or nylon bands.
- 17-f)** The insulation shall have a vapor barrier installed to the exterior and the joints shall be sealed with butyl tape, caulking or mastic.

Replacement Thermostats

- 17-g)** Mercury thermostats shall be properly disposed.

Hydronic Pipe Insulation

- 17-h)** Hydronic pipes shall be insulated with 1 inch material having a minimum R-4 pipe insulation specifically manufactured as hydronic pipe insulation. Joints and elbows shall be insulated.

Water Heater and Water Line Insulation

- 17-i)** Water heater insulation shall be a minimum R-5 blanket secured with tape and bound with a minimum of 2 wire, cord, plastic or nylon bands on the tank.
- 17-j)** Water lines shall be insulated a minimum of 18 feet of hot and 3 feet of cold in all directions from the water heater, using properly sized preformed pipe wrap or insulation specifically designed as pipe wrap.

Mobile Home specific work standards

- 17-k)** All accessible water lines in the water heater

from water boilers or steam boilers.

Water lines that have asbestos pipe wrap shall not be insulated or sealed in the area containing the asbestos.

Insulation shall not be installed on water heaters if doing so voids the warranty of the unit or if the water heater is lacking a pilot access door or pressure relief valve.

Pipe wrap shall not be installed if the water heater lacks a pressure relief valve.

In renter occupied homes, if inefficient water heaters are replaced in accordance with these installation standards the Weatherization Assistance Program may contribute a maximum of \$150.

In owner occupied homes, the replacement of furnaces, water heaters, central air conditioners or heat pumps for energy efficiency reasons may not be charged to the Health and Safety line item.

In renter occupied homes, if furnaces, central air conditioners or heat pumps are replaced for efficiency reasons in accordance with these installation standards the Weatherization Assistance Program may contribute a maximum of \$500. These expenditures may not be charged to the Health and Safety line item.

compartment shall be insulated using properly sized preformed pipe wrap or insulation specifically designed as pipe wrap.

- 17-l) Electric water heaters shall have the top insulated and the thermostat control access panels accessible or marked and labeled.
- 17-m) Each section of preformed pipe wrap shall be fastened with a minimum of 3 wire, cord, plastic or nylon bands.
- 17-n) Joints and elbows shall be insulated.
- 17-o) Duct tape shall not be used as a means of fastening the pipe wrap.
- 17-p) Insulation shall not cover the pressure relief valve, end of the drip leg, draft hood, burner air inlet, pilot light access door, thermostat control, drain valve or the top of the water heater on natural gas or propane water heaters.
- 17-q) Insulation shall not cover the pressure relief valve, end of the drip leg, high limit switch, plumbing pipes or drain valve on electric water heaters.
- 17-r) Pipe wrap shall not begin within 2 inches or farther than 4 inches of a flue and/or draft hood.

Replacement Water Heater

- 17-s) New gas water heaters shall have a minimum efficiency of .60 and new electric water heaters shall have a minimum efficiency of .91.
- 17-t) A service label shall be placed on or near the water heater containing the name, business address and phone number of the company or agency performing the work, any repairs that were completed and the date the work was performed.

Replacement Heating Plant

- 17-u) Forced air furnaces shall have a minimum AFUE of 90 percent, boilers a minimum of 85 percent and wall and console heaters, a minimum of 80 percent.
- 17-v) Efficiency ratings for forced air furnace and boilers must be listed in the most current edition of the Gas Appliance Manufacturers Association (GAMA) Consumer's Directory of Certified Efficiency Ratings for Residential Heating and Water Heating Equipment.
- 17-w) Heat exchangers in all replacement heating plants shall have a minimum 10 year manufacturer's warranty.

	<p>17- x) The replacement heating plant shall be competitively bid and properly sized using the post-weatherization characteristics of the home.</p> <p>17-y) The service label shall be placed on or near the heating plant containing the name, business address and phone number of the company or agency performing the work, any repairs that were completed and the date the work was performed.</p> <p><u>Mobile Home specific work standards</u></p> <p>17-z) Forced air furnaces shall have a minimum AFUE of 90 percent, if possible or be the highest efficiency practical.</p> <p>17-1a) The replacement heating plant shall be specifically manufactured for use in mobile homes.</p> <p>17-1b) If the connection between the new furnace and the trunk line will not be accessible after installation, the heating contractor shall seal the connection.</p> <p>Central Air Conditioners and Heat Pumps</p> <p>17-1c) Replacement central air conditioners shall be a minimum 14-SEER (Seasonal Energy Efficiency Factor) and use environmentally friendly Freon.</p> <p>17-1d) Replacement heat pumps shall be a minimum 14-SEER and 8.2-HSPF (Heating Seasonal Performance Factor) and use environmentally friendly Freon. Heat pumps must be installed with a ramp-up type thermostats designed to bring backup heat in stages, and only when the heat pump can no longer keep up with demand, and must be able to differentiate between a demand call and a 'return from setback' call for heat.</p> <p>17-1e) The replacement central air conditioner or heat pump shall be properly sized using the post weatherization characteristics of the home.</p> <p>17-1f) Replacement central air conditioners and heat pumps shall be replaced by a Qualified Heating Technician.</p> <p>17-1g) A service label shall be placed on or near the furnace plenum containing the name, business address and phone number of the company performing the work, any repairs that were completed and the date the work was performed.</p>
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	<p style="text-align: center;">Venting and Ductwork</p> <p>17-1h) The replacement heating plant, central air conditioners or heat pumps shall use the existing distribution system, if possible.</p> <p>17-1i) New ductwork or hydronic pipes may be installed to properly balance the system. Flexible ductwork shall be no more than 4 lineal feet per run.</p> <p>17-1j) The replacement heating plant shall be properly vented and use outside combustion air if the unit has provisions for dedicated outside combustion air.</p> <p>17-1k) If the replacement heating plant is installed with existing or new central air conditioning, the air conditioner evaporator coil should be a cased coil or be raised and made accessible for periodic service and cleaning.</p> <p>17-1l) The condensate line shall not be drained to the exterior of the home.</p> <p>17-1m) If a new forced-air furnace or boiler is installed that will not be vented through the masonry chimney but the water heater will still be vented through that chimney, a properly sized flue liner shall be installed.</p> <p>17-1n) As an alternative, a power vent may be installed on the water heater.</p> <p>17-1o) Furnace filter racks on new heating systems shall be installed in an area that is convenient and conducive for the customer to access.</p> <p style="text-align: center;">Thermostat</p> <p>17-1p) The thermostat shall be calibrated and adjusted and any operable accessories that were installed on the existing heating system shall be removed and reinstalled on the new heating system, if possible. If a new thermostat is installed, the wire hole in the wall behind the thermostat shall be sealed.</p> <p><u>Mobile Home specific work standards</u></p> <p>17-1q) The combustion air sleeves and air conditioner condensates to the underbelly shall not be covered.</p> <p>17-1r) When the return air system is blocked and sealed a minimum 16 inch x 24 inch vent shall be installed in the furnace compartment door.</p>
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	<p>17-1s) If the vent is not installed, the floor shall be not be insulated.</p> <p>17-1t) Interior doors may need to be <u>under-cut</u> to provide adequate return air to the furnace.</p> <p>Definitions:</p> <p>-Under-cut. To cut the bottom of an interior door to allow return air to flow from that area to the furnace compartment or common return.</p>
<p>18) AIR INFILTRATION</p> <p>All direct penetrations to the exterior of the heated envelope shall be sealed.</p> <p>A maximum of \$40 in material and labor per 100 <u>cfm50</u> reduction in air leakage may be spent.</p> <p>Definitions:</p> <p>- <u>cfm50.</u> Cubic feet per minute of airflow at a 50 Pascal pressure difference between the interior and exterior of a structure.</p> <p>The cfm50 reductions shall be checked at the end of each measure to determine its cost effectiveness.</p> <p><u>Mobile Home specific measures</u></p> <p>Exterior water heater compartments shall be sealed and isolated from the interior of the home.</p> <p>Water heater compartment doors that are beyond repair shall be replaced.</p> <p>Exterior doors that are beyond repair shall be replaced.</p> <p>With the client’s permission, a peephole or door light may be installed.</p> <p>Door insect screens may be repaired or replaced.</p> <p>Outlet and switchplate insulators may be installed on exterior and interior walls. If the outlet or switch has aluminum wiring, insulators shall not be installed.</p>	<p style="text-align: center;">General</p> <p>18-a) All materials used to seal direct penetrations shall form a permanent and airtight seal.</p> <p style="text-align: center;">Caulking and Air Sealing Materials</p> <p>18-b) Caulking shall be paintable and shall be clear or a color complementary to the surface to which it is applied.</p> <p>18-c) Caulking installed around heat-producing sources shall be specifically manufactured for installation around heat sources.</p> <p>18-d) Openings wider than ¼ inch shall be packed with material specifically designed as a packing material prior to caulking.</p> <p>18-e) Packing material shall be compatible with the type of caulking used.</p> <p>18-f) Expanding and non-expanding foam sealant may be used as an air sealing material.</p> <p>18-g) If mortar or mortar patch is used, it shall be a color complementary to the surface to which it is applied and be textured to match the surrounding surface as close as possible.</p> <p>18-h) Spray applied insulation may be used as an air sealing material.</p> <p><u>Mobile Home specific work standards</u></p> <p>18-i) All openings from the water heater compartment into the heated space shall be sealed with metal or 5/8” fire code drywall.</p> <p style="text-align: center;">Doors</p> <p>18-j) Replacement doors shall be solid core, wood insulated or pre-hung metal insulated doors. Pre-hung metal insulated doors shall be R-7 or greater.</p> <p>18-k) Existing locksets may be reinstalled on the new door.</p>

<p>Weather-strips, thresholds, door bottoms and sweeps shall be replaced, as necessary.</p>	<p>18-l) If a new lockset is installed, 2 keys shall be provided to the client.</p> <p>18-m) Any safety lock installed on the existing door shall be removed and reinstalled on the new door.</p> <p>18-n) The existing casing may be reinstalled but if new casing is needed, the casing shall match the existing in design and dimension, as closely as possible. The cavities around the door frame shall be insulated or sealed with non-expanding foam sealant.</p> <p>18-o) Door lights with uninsulated glass shall not exceed 1 square foot.</p> <p>18-p) Door lights with insulated glass shall not exceed 2 square feet.</p> <p>18-q) All door casings shall be caulked.</p> <p>18-r) Doors shall conform to the thickness of the existing jamb.</p> <p>18-s) Solid core doors shall have 3 hinges.</p> <p>18-t) If trimming the bottom of the door is necessary; the door shall be trimmed at a 5 degree angle.</p> <p>18 u) Weather-strips, thresholds, door bottoms and sweeps shall have a vinyl or silicone insert.</p> <p>18-v) Weather-strips and sweeps shall have the last fastener or screw no more than 2-1/2 inches from the end.</p> <p>18-w) Minor door adjustments such as tightening the hinges or adjusting the strike plate shall be completed.</p> <p><u>Mobile Home specific work standards</u></p> <p>18-x) The replacement doors shall be a mobile home door, a solid core, a wood insulated or a prehung metal insulated door with an R-value of 7 or greater.</p> <p>18-y) On new doors, a gutter, flashing or a drip cap shall be installed.</p> <p style="text-align: center;">Below and Grade-Level Doors</p> <p>18-z) Custom made below-grade doors shall be constructed of 3/4 inch pressure treated exterior grade plywood.</p> <p>18-1a) The door shall be reinforced with 1x4 inch common lumber and insulated with a minimum R-7 rigid insulation and framed with pressure treated wood, redwood or cedar.</p>
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Broken or missing storm door and door glass shall be repaired or replaced.

Mobile Home specific measures

If the mobile home exterior walls will accept house type replacement windows they may be installed.

- 18-1b)** The door shall be attached with a minimum of 2 hinges and a minimum of one latching mechanism, weather-stripped and the bottom of the door sealed.
- 18-1c)** The door shall have a handle on both the interior and exterior of the door.
- 18-1d)** Thresholds shall be wood or aluminum and be caulked at the sill.
- 18-1e)** If trimming the bottom of the door is necessary, the door shall be trimmed at a 5 degree angle.
- 18-1f)** Weather-strips, thresholds, door bottoms and sweeps shall have a vinyl or silicone insert.
- 18-1g)** Weather-strips and sweeps shall have the last fastener or screw no more than 2-1/2 inches from the end.
- 18-1h)** Minor door adjustments such as tightening the hinges or adjusting the strike plate, shall be completed.

Door Glass

- 18-1i)** Replacement door glass shall not be less than "B" grade single strength.
- 18-1j)** Door glass over 40 inches in either dimension shall not be less than "B" grade double strength.
- 18-1k)** Door glass over 1 sq. ft. shall be safety glass.
- 18-1l)** Door glass shall be secured with glazing points and glazing compound, if necessary and shall completely cover the channel.
- 18-1m)** Damaged decorative door glass shall be replaced with a standard glass pane.
- 18-1n)** If the client refuses a standard door glass pane, the door glass shall be repaired with clear silicone caulk or a material specifically designed to repair glass.
- 18-1o)** If the existing door glass is a thermal pane or insulated glass and the interior or exterior pane is cracked, the cracked door glass shall be repaired.
- 18-1p)** If the interior and/or exterior panes of door glass are broken, the door glass shall be replaced. Glass over 1 sq. ft. shall be replaced with safety glass and 1 sq. ft. or less shall be replaced with a standard glass pane.

	<p style="text-align: center;">Window Glass</p> <p>18-2g) Replacement window glass shall not be less than “B” grade single strength.</p> <p>18-2h) Window glass over 40 inches in either dimension shall not be less than “B” grade double strength.</p> <p>18-2i) Window glass shall be secured with glazing points and glazing compound, if necessary and shall completely cover the channel.</p> <p>18-2j) Damaged decorative window glass shall be replaced with a standard glass pane.</p> <p>18-2k) If the client refuses a standard window glass pane, the window glass shall be repaired with clear silicone caulk or a material specifically designed to repair glass.</p> <p>18-2l) If the existing window glass is a thermal pane or insulated glass and the interior or exterior pane is cracked, the cracked glass shall be repaired.</p> <p>18-2m) If the interior and/or exterior panes of window glass are broken, the window glass shall be replaced with a standard glass pane.</p>
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ENVELOPE INSULATION

<p>19) WALL INSULATION</p> <p>Siding shall be removed or drilled and all enclosed wall cavities shall be filled. Wall cavities that are less than 3 feet in height or where it is not possible to tube fill may be insulated through a minimum 1 inch entry</p>	<p style="text-align: center;">General</p> <p>19-a) Insulation shall be installed using the <i>tube-fill method</i> to a minimum density of 3.4 pounds per cubic foot.</p> <p>Definitions: -<u>Tube-fill method</u>. An insulation technique developed to install high density blown insulation in enclosed cavities.</p> <p>19-b) Wall repairs shall be durable and permanent and match the existing area as closely as possible.</p> <p>19-c) Materials used in areas of high moisture or areas exposed to the weather must be suitable grade materials.</p> <p style="text-align: center;">Siding Removal</p> <p>19-d) The removed siding shall be reinstalled using the original fastening system whenever possible. The seam tabs on slate siding shall be re-installed.</p> <p>19-e) The entry holes shall be sealed with plastic or wood plugs, or covered with felt paper prior to reinstalling the siding if the siding was removed.</p>
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<p>holes.</p> <p>Interior and exterior walls shall be repaired prior to insulating.</p> <p>Open wall cavities shall be covered and insulated with batt, blown or spray-applied insulation.</p> <p>Kneewalls that will be covered shall be insulated with either batt or blown insulation.</p> <p>The floor cavities at the base of the kneewalls shall be tightly packed with batt, blown, rigid or spray-applied insulation.</p> <p><i>Accessible kneewall</i> cavities that are not enclosed or will not become enclosed shall be insulated with batt or spray-applied insulation.</p> <p>Definitions:</p> <p>-<i>Accessible Kneewalls</i>. A kneewall with a minimum 36 inch clearance measured from the top of the floor joist to the bottom of the rafters and a minimum 36 inch clearance measured from the kneewall to the exterior wall.</p> <p>Accessible kneewalls shall have a minimum of 1 access.</p>	<p>19-f) Entry holes in stucco or masonry siding shall be sealed with mortar or a material specifically manufactured to repair stucco or masonry.</p> <p>19-g) The sealing material shall completely seal the opening and be textured and painted to match the surrounding surface.</p> <p>19-h) Whenever plastic or wood plugs are used on the exterior of the siding, the plugs shall be painted to match the existing siding color.</p> <p>19-i) Interior entry holes in drywall or plaster shall be plugged and taped or sealed with a material specifically manufactured to repair drywall or plaster.</p> <p>19-j) Interior entry holes shall be made ready for paint.</p> <p style="text-align: center;">Open Wall Cavities</p> <p>19-k) If the covering is drywall, the drywall shall be taped and receive one coat of joint compound.</p> <p>19-l) If plywood, chipboard or hardboard is installed, the joints shall be caulked.</p> <p>19-m) If faced batt insulation is installed, the vapor barrier shall be installed to the warm side and fit snugly between the studs and wall.</p> <p style="text-align: center;">Kneewalls</p> <p>19-n) The insulation shall be held in place with staples, twine, wire, hex netting or wire expanders and shall be covered with an <i>air infiltration barrier</i>.</p> <p>Definitions:</p> <p>-<i>Air Infiltration Barrier</i>. A covering that will allow moisture out and not allow air into a space or wall cavity.</p> <p>19-o) If batt insulation is used to seal the base of the kneewalls, the batt shall be sealed in an enclosed vapor barrier.</p> <p>19-p) Materials used shall form an airtight seal.</p> <p>19-q) If spray-applied insulation is used, an air infiltration barrier is not needed.</p> <p style="text-align: center;">Accesses</p> <p>19-r) Accesses adjacent to conditioned areas shall be weather-stripped and insulated with R-11 batt or a minimum R-7 rigid insulation attached to the access door.</p> <p>19-s) The trim of the access shall be caulked with clear caulking or caulking that is a color complementary to the surface to which it is applied.</p>
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<p>If new accesses are needed, the access door shall be located in an area agreeable to the client and conducive to the installation of the insulation.</p>	<p>19-t) New accesses shall be properly framed and be a minimum of 13 inches wide and 20 inches in height.</p> <p>19-u) New access covers or doors shall be minimum ¾ inch plywood and attached with a minimum of 2 hinges and 2 latching mechanism.</p> <p>19-v) New accesses shall be finished to match the wall or trim as closely as possible.</p>
<p>20) CEILING INSULATION</p> <p>The ceilings must be inspected to ensure that the weight of the added insulation will be supported.</p> <p>Leaks in the roof and penetrations in the ceilings shall be repaired prior to insulating the attic.</p> <p>Blown insulation specifications shall be stapled near the attic access of each accessible attic.</p> <p>Cellulose insulation should be installed over existing batt insulation.</p> <p>Enclosed ceilings shall be insulated the full cavity depth.</p>	<p style="text-align: center;">General</p> <p>20-a) Sealing and repair materials shall match the existing surfaces as closely as possible.</p> <p><u>Mobile Home specific work standards</u></p> <p>20-b) Interior entry holes shall be sealed with wood or plastic plugs.</p> <p>20-c) The plugs shall be caulked in place.</p> <p>20-d) Exterior entry methods shall form a permanent and watertight seal.</p> <p>20-e) Flat roofs or roofs that do not have adequate slope to insure proper drainage shall not be penetrated to install the insulation.</p> <p>20-f) If a minimum R-11 of additional insulation cannot be installed, the ceiling shall not be insulated.</p> <p>20-g) All insulation installed should extend over the top of all exterior plates and be the full R-value.</p> <p>20-h) The insulation specifications shall include the insulation brand name, thermal resistance chart and certification that the insulation conforms to federal specifications.</p> <p>20-i) The specifications shall also include the name of the company or agency that installed the insulation, the date the insulation was installed, the number of bags of insulation installed, the square footage installed and the R-value of the added insulation.</p> <p style="text-align: center;">Insulating Over Existing Batt Insulation</p> <p>20-j) If additional batt insulation must be installed, the new batt should be unfaced and installed perpendicular to the existing batt insulation.</p> <p style="text-align: center;">Insulating Enclosed Ceilings</p> <p>20-k) Insulation shall be installed using the tube-fill method to a minimum of 3.4 pounds per cubic foot.</p>

Shielding shall be installed around attic accesses, exhaust fans, soffit vents and uninsulated attics adjacent to insulated attics.

Attic venting shall be installed prior to insulating.

Venting shall not be installed on metal roofs.

Attics with metal roofs that cannot be properly vented shall not be insulated.

All *accessible attics* over 100 square feet shall have an access.

-Accessible Attic. An attic with a minimum 24 inch clearance measured from the bottom of the top cord or ridge board to the top of the ceiling joists.

New attic accesses shall be located in an area agreeable to the client, be conducive to adding insulation and installed as per state and local

Shielding

- 20-l) Attic accesses shall be shielded with 1 inch common lumber or ¾ inch plywood.
- 20-m) Exhaust fans that cannot be vented to the exterior shall be shielded with 1-inch common lumber or ¾ inch plywood or metal.
- 20-n) If a standpipe is installed, insulation may be installed over the exhaust fan.
- 20-o) The standpipe shall be attached with screws.
- 20-p) Fiberglass batt, foam board, fiberboard, treated cardboard, plywood or common lumber shall be used as shielding or damming at insulated attic perimeters.
- 20-q) All shielding shall be installed at a height to accommodate the depth of the added insulation and be kept a minimum of 3” from any heat source and a minimum of 6” from a high heat source. If a masonry chimney has an existing metal or metalbestoes flue liner, the chimney does not need to be shielded.

Attic Venting

- 20-r) Attics over 100 square feet shall be vented with a minimum of 1 square foot of net free vent area for every 600 square feet of attic area.
- 20-s) Attics over 100 square feet, but less than 200 square feet, shall be vented with a minimum of one vent.
- 20-t) Attics over 200 square feet shall have 2 vents.
- 20-u) Roof vents should not be installed over framing members. If vents must be installed over framing members, care must be taken to insure that the rafters are not cut. The roof vent opening is to be framed.
- 20-v) Soffit vents should be installed with the fins facing towards the house with rust proof, pan-headed screws.
- 20-w) Gable vents should be set in caulking and nailed or screwed in place using rust proof fasteners. The vent shall be trimmed.
- 20-x) Gable vents installed in siding without wood sheathing behind it shall have the vent framed.
- 20-y) Roof, turbine and ridge vents shall be sealed with roofing tar and attached with roofing nails.
- 20-z) Roof vents shall be centered within 2 feet of

<p>codes.</p> <p>A new attic hatch cover shall be installed on new accesses and on existing accesses, if necessary.</p>	<p>the ridge or peak of the roof.</p> <p>20-1a) The shingles shall overlap the top half of the roof vent flange. The bottom half of the vent's flange shall be exposed on top of the shingles.</p> <p>20-1b) Venting should be evenly spaced and should be divided evenly between high and low or intake and exhaust vents.</p> <p>20-1c) Roof, turbine and ridge vents are considered to be high or exhaust vents, while soffit and gable vents are considered to be low or intake vents.</p> <p style="text-align: center;">Attic Accesses</p> <p>20-1d) The new hatch shall be properly framed and should have a minimum opening of 13 inches x 20 inches and boxed with 1 inch thick common lumber or ¾ inch plywood at a height to accommodate the added insulation.</p> <p>20-1e) New and existing attic accesses adjacent to conditioned areas shall be weather-stripped and insulated with R-19 batt and the insulation shall fit snug to the damming boards. The insulation shall be attached to the access door.</p> <p>20-1f) The hatch casing shall be caulked with a paintable clear caulk or with a color complementary to the surface to which it is applied.</p> <p>20-1g) The hatch cover shall be constructed of ¾ inch plywood or particle board.</p> <p>20-1h) If a walk-up attic access is present, the access shall be weather-stripped and insulated with R-19 batt or R-14 rigid insulation and be hinged</p> <p>20-1i) If a pull-down ladder hatch is present it shall be shielded with 1-inch common lumber or ¾ inch plywood with a hinged ¾ inch plywood lid and insulated with R-19 batt or R-14 foam board.</p> <p>20-1j) Attic and attic access insulation shall be installed to provide a continuous insulation coverage. Batt insulation may need to overlap the opening.</p> <p>20-1k) The access shall be caulked with a paintable clear caulking or with a color complementary to the surface to which it is applied.</p> <p>20-1l) The access shall be finished to match the ceiling or trim where installed as closely as possible.</p>
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21) FOUNDATION INSULATION

Floor insulation shall be installed in crawl spaces that are unconditioned.

If there is a wall between an unconditioned crawl space and a conditioned *basement*, the wall shall be insulated.

Definitions:

-Basement. The bottom full story of a building below the first floor. A basement may be partially or completely below grade.

-Accessible Foundation. A foundation with a minimum 24 inch clearance measured from the bottom of the floor joist to the ground.

-Conditioned. A space that contains a source intended specifically to heat or cool that space.

-Crawl Space. A space below the first floor that is less than full story height. Ledge basements that are 6 feet or more deep are to be considered a crawl space.

-Unconditioned. An area having no source of heat or cooling.

All accessible crawlspaces shall have an access.

New crawl space accesses shall be located in an area agreeable to the client and conducive to insulating.

Existing exterior accesses shall be weather-stripped.

Accesses adjacent to conditioned areas where the common walls are treated shall be weather-stripped and insulated.

A new access cover and/or hardware shall be installed if necessary.

Basement Walls

- 21-a) Insulation shall be batt, spray applied or foam board.
- 21-b) If batt insulation is used the wall shall be framed to adequately support the insulation.
- 21-c) If foam board is used the insulation shall be attached to the foundation wall with construction adhesive or masonry nails or a combination of the two.
- 21-d) Batt, spray applied and foam board insulation shall be covered with plywood, paneling or drywall.
- 21-e) Basement wall insulating systems shall be installed according to manufacturer's instructions and be a minimum R-10.

Crawl Space and Ledge Basement Walls

- 21-f) Crawl space and ledge basement wall shall be insulated with faced batt foam board or spray applied insulation.
- 21-g) The insulation shall fill the sill box, extend down the foundation wall and lay a minimum of 24 inches on top of a ground laid moisture barrier.
- 21-h) To ensure there are no gaps in the wall insulation, 24 inch wide batts shall be used in areas of 16 inch floor joist spacing and 16 inch batts shall be used in areas of 24 inch joist spacing.
- 21-i) If faced batt insulation is installed, the vapor barrier shall be to the warm side and the insulation shall be supported with twine, wire, hex netting or wire expanders.

Accesses

- 21-j) New exterior accesses shall be constructed of ¾ inch pressure treated plywood, be a minimum of 20 inches in width, be attached with 2 hinges and a latching mechanism and be weather-stripped and insulated with minimum R-11 batt or a minimum R-7 rigid insulation.
- 21-k) Any new framing shall be pressure treated, redwood or cedar.
- 21-l) New floor accesses shall be properly supported.

<p>The ceilings of garages must be inspected to ensure that the weight of the added insulation will be supported.</p> <p>If exposed floors are un-insulated and inaccessible, insulated skirting may be installed.</p> <p>Definition: <u>-Exposed Floors.</u> A floor that is in direct contact with the outside air. Examples are cantilevers, the floors of bay or bow windows, garage ceilings, etc.</p> <p>A minimum of one access shall be installed.</p> <p>Sill box insulation shall be installed in all accessible cavities with a depth of 2 inches or more.</p>	<p>21-m) If floor insulation is installed, the floor access shall be weather-stripped and insulated with minimum R-11 batt or a minimum R-7 rigid insulation.</p> <p>21-n) Existing exterior accesses shall be weather-stripped and insulated with minimum R-11 batt or a minimum R-7 rigid insulation.</p> <p>21-o) Hardware may be added if necessary.</p> <p style="text-align: center;">Floors</p> <p>21-p) Exposed floors except over garages shall be insulated with batt or blown insulation and covered with exterior grade plywood or tar impregnated fiberboard and the seams shall be caulked.</p> <p>21-q) Exposed floors over garages shall be insulated with batt or blown insulation. Fire code drywall shall be installed on open floor cavities over garages. The drywall shall be taped and receive one coat of joint compound or the joints and seams shall be caulked to form an airtight seal.</p> <p>21-r) Accessible exposed floors that have an existing covering shall be insulated with blown insulation installed at a minimum of 3.4 pounds per cubic foot and the entry holes shall be sealed with wood or plastic plugs.</p> <p style="text-align: center;">Insulated Skirting</p> <p>21-s) The skirting shall be metal, vinyl or <u>pressure treated</u> plywood supported by a wood frame and insulated with a minimum R-11 faced batt or a minimum R-10 foam board.</p> <p>Definitions: <u>-Pressure Treated.</u> Lumber that has been commercially chemically treated under pressure with a wood preservative to prevent damage from moisture, insects, fungi and other forms of biological decay.</p> <p>21-t) The frame shall have a pressure treated, redwood or cedar bottom plate and the vertical studs should be placed on a minimum 24 inch centers.</p> <p>21-u) Insulation shall cover the top plate and extend a minimum of 24 inches on top of a ground laid moisture barrier.</p> <p>21-v) All seams and joints in the skirting shall be caulked.</p> <p>21-w) The access shall be constructed of ¾ inch pressure treated plywood, and be a minimum of 20 inches in width, be attached with 2 hinges and a latching mechanism and be</p>
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	<p>weather-stripped and insulated with minimum R-11 batt or a minimum R-7 rigid insulation.</p> <p>21-x) A manufactured insulating skirting kit may be used. The kit shall be a minimum R-8 insulation and include 1 access.</p> <p style="text-align: center;">Sill Box</p> <p>21-y) Sill box insulation shall be a minimum R-10.</p> <p>21-z) If batt insulation is installed the vapor barrier shall be to the warm side and fit snugly between the floor joists, sill plate and subflooring.</p> <p>21-1a) Where the insulation runs parallel with the floor joists, it shall be stapled in place.</p> <p>21-1b) The vapor barrier shall completely cover the insulation to prevent fibers from entering the basement.</p> <p>21-1c) Spray-applied insulation may be used and left uncovered.</p> <p>21-1d) Rigid insulation may be left uncovered and shall fit snugly between the floor joists, sill plate and subflooring.</p>
<p><u>Mobile Home specific measures</u></p> <p>22) UNDERBELLY INSULATION</p> <p>Prior to weatherizing the underbelly, the owner shall repair plumbing leaks that will directly affect the weatherization of the underbelly.</p> <p>Underbellies that have 2 inches or less of existing insulation are considered uninsulated.</p> <p>When 50% or less of the existing insulation is missing, deteriorated or damaged the damaged areas shall be repaired.</p> <p>When more than 50% of the existing insulation is missing, deteriorated or damaged, the entire underbelly shall be reinsulated.</p> <p>Existing insulation in undamaged areas does not need to be removed, but additional blown insulation shall be installed.</p>	<p><u>Mobile Home specific work standards</u></p> <p style="text-align: center;">General</p> <p>22-a) Insulation shall be installed the full cavity depth whenever possible.</p> <p>22-b) Replace all deteriorated or damaged insulation with unfaced batt insulation and <u>new weatherboard</u> or by replacing the weatherboard and then installing blown insulation.</p> <p>Definition:</p> <p>-<u>Weatherboard</u>. A covering consisting of a minimum 30 pound felt paper, exterior grade plywood, fiberboard, an air infiltration barrier or a material specifically manufactured as mobile home weatherboard installed on the underside of a mobile home to support and protect the floor insulation.</p> <p>22-c) The weatherboard must form an airtight seal and adequately support the insulation.</p> <p>22-d) If plywood is used as weatherboard, the plywood shall be exterior grade.</p> <p>22-e) If insulation is installed through the rim joist, a rigid tube shall be used.</p> <p>22-f) Entry holes in the rim joist shall be plugged with wood plugs and glued in place.</p>

A full ground laid moisture barrier shall be installed on mobile homes with relatively tight skirting or when insulated skirting is installed.

A moisture barrier may be omitted in areas where run off or rain water is likely to collect. For homes that received insulating skirting ground insulation shall not be installed in areas where the moisture barrier has been omitted.

A minimum of 2 manual or thermatic foundation vents may be installed when the skirting is tight.

Inaccessible underbellies that are uninsulated may be weatherized using insulated skirting.

Definition:

-Inaccessible Underbellies. A mobile home underbelly with less than 24 inches clearance, measured from the weatherboard to the ground at the area to be weatherized.

A minimum of one access shall be installed.

22-g) If insulation is installed through the weatherboard, the entry holes shall be covered with plastic plugs or 30# felt paper. Both should be sealed with caulking.

22-h) Rim joists that are 2 inches x 4 inches or less in construction shall not be drilled.

22-i) Special care needs to be taken so as not to isolate water pipes outside the envelope.

Moisture Barrier

22-j) The moisture barrier shall be a minimum 6 mil polyethylene and extend up the exterior walls and support columns at least 12 inches and the joints shall overlap a minimum of 12 inches.

22-k) In the event the entire floor cannot be covered, all accessible areas shall receive a moisture barrier.

22-l) When installing insulated skirting without adequate clearance, the moisture barrier shall extend a minimum of 24 inches beyond the insulation, and a minimum of 2 manual or thermatic foundation vents may be installed.

Venting

22-m) When vents are installed, the venting ratio shall be a minimum of 1 square foot of net free vent area for every 1500 square feet of underbelly.

22-n) All exhaust vents and combustion air vents shall be vented through the skirting.

Insulated Skirting

22-o) The skirting shall be metal, vinyl or pressure treated plywood supported by a wood frame and insulated with a minimum R-11 faced batt or a minimum R-10 foam board.

Definition:

-Pressure Treated. Lumber that has been commercially treated under pressure with a wood preservative to prevent damage from moisture, insects, fungi and other forms of biological decay.

22-p) The frame shall have a pressure treated, redwood or cedar bottom plate and the vertical studs should be placed on 24 inch centers.

22-q) Insulation shall cover the top plate and extend a minimum of 24 inches on top of a ground laid moisture barrier.

22-r) Manufactured insulating skirting may be used. It shall have a minimum of R-8 insulation.

	<p style="text-align: center;">Accesses</p> <p>22-s) The access shall be constructed of 3/4 inch pressure treated plywood, be a minimum of 20 inches in width, be attached with 2 hinges and a latching mechanism and be weather-stripped and insulated with R-11 batt or a minimum R-7 rigid insulation.</p> <p>22-t) Manufactured insulating skirting shall have one access.</p>
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<u>ELECTRIC BASELOAD</u>	
<p>23) ELECTRIC BASELOAD</p> <p>Compact fluorescent bulbs shall be installed in light fixtures that will accept them and will be used more than 15 hours per week.</p> <p>Incandescent light fixtures may be replaced with fluorescent light fixtures that will be used more than 15 hours per week.</p> <p>Electro-luminescent night lights may be installed to replace existing incandescent night lights.</p>	<p>23-a) Lumen output should be matched as closely as possible to the incandescent that was removed.</p>

