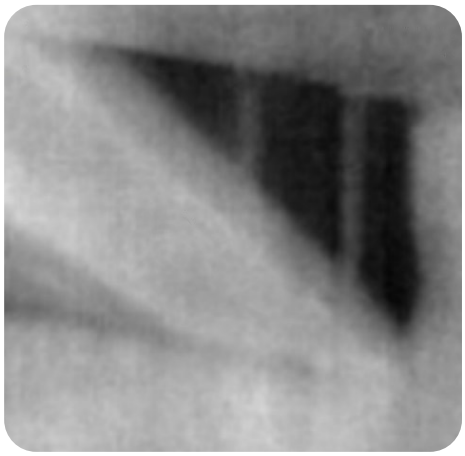
MICHIGAN WEATHERIZATION FIELD GUIDE

STANDARD WORK SPECIFICATION-ALIGNED





2026

All work should abide by the local authority having jurisdiction.

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Last updated 02/23/2026

Updates performed by Michigan Department of Health and Human Services (MDHHS)

Created by the Energy Smart Academy at Santa Fe Community College

For the Weatherization Collaborative

In alignment with the Standard Work Specifications

Created by the National Renewable Energy Laboratory,

found at https://sws.nlr.gov.

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PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDE



Safety Glasses



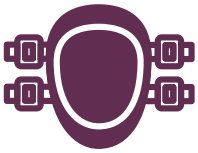
Hearing Protection



Hard Hat



Bump Cap



Knee Pads



Gloves – Leather or Heavy Cloth



Gloves – Nitrile



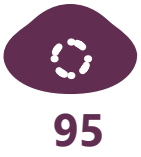
Tyvek Suit



Boot/Shoe Covering



N-95 Mask without Exhale Valve



N-95 Mask with Exhale Valve



Half-Face P-100 Respirator



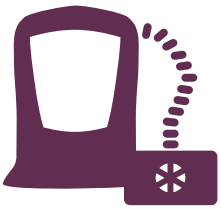
Half-Face P-100 Respirator with OV Valve



Full-Face P-100 Respirator



Full-Face **OV** P-100 Respirator with OV Valve



Powered Air Purifying Respirator



Cooling Vest

1-1 INTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP

Follow CSPM 600 for training & documentation requirements





BEFORE

✗ Homes built before 1978 have the potential for lead paint and require special considerations during retrofitting.

AFTER

✓ No lead dust or debris remains inside the home.

✓ Contaminated materials have been disposed of or cleaned properly.

✓ Disposal containment is securely closed.

IMPORTANT

This section does not replace EPA Lead Renovation, Repair, and Painting (RRP) training or certification. Compliance with EPA handling and safety requirements is mandatory.

PPE



** Weather dependent.*

TOOLS

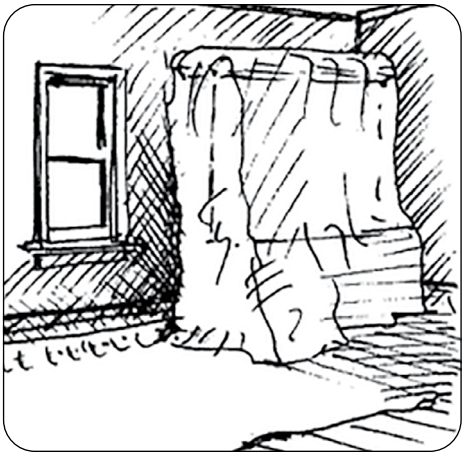
- Zip walls.
- HEPA vacuum.
- Hand tools.
- Shrouded power tools.
- Half or full-face respirator (fit-tested).

MATERIALS

- 6-mil plastic sheeting.
- Signage.
- Tack pads.
- Painters tape.
- Trash bags.
- Disposable Tyvek suits.
- Booties.
- Nitrile gloves.
- P-100 filters.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

1-1 INTERIOR LEAD-SAFE WEATHERIZATION



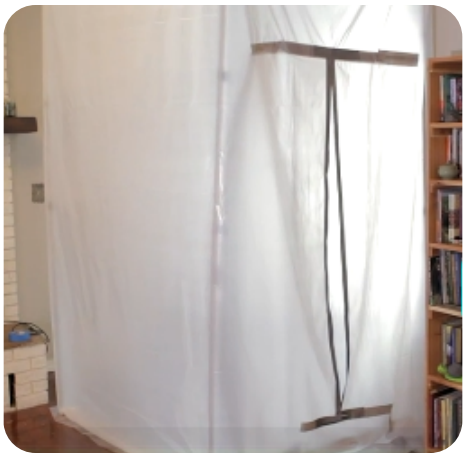
1. Move furniture out of work area and, if it cannot be removed, securely cover horizontal with plastic sheeting.



2. Use disposable physical barriers to mark out and contain work area dust and debris.



3. Six feet in any direction from the work area, cover surfaces with plastic sheeting, taped in place, including HVAC access points.



4. Block off access doorways and install zippers to contain debris in work area.

CAUTION

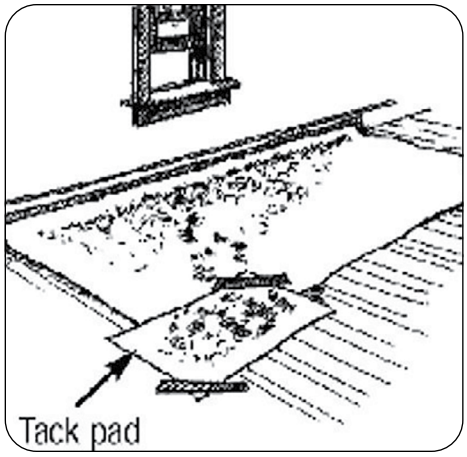
Half and full-face respirators, required for lead renovation work, must be fit-tested on all workers at least once a year. The respirator must form a tight seal at the face and neck. Workers who have a beard cannot wear a half- or full-face respirator, since they will not form a tight seal and contaminants can bypass the respirator. Bearded workers need to wear a powered air-purifying respirator (PAPR).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

1-1 INTERIOR LEAD-SAFE WEATHERIZATION



5. Post signs outside work area to prevent anyone from unintentionally entering work area.



6. Use tack pads at access points to containment area to minimize dust and debris being tracked outside area.



7. Wear appropriate PPE, including Tyvek suit, gloves and P-100 HEPA disposable or fit-tested respirator.



8. Utilize hand tools and/or shrouded tools that minimize dispersion of dust and debris.

IMPORTANT

All workers disturbing painted surfaces are either certified renovators or trained by one. A certified renovator is assigned to each project and fulfills all required duties.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

1-1 INTERIOR LEAD-SAFE WEATHERIZATION





Folding poly to the inside and bagging.

9. Wipe down surfaces and vacuum work area, taking special care and attention of cracks and crevices where dust and debris might collect.



10. Carefully roll up and dispose of any plastic sheeting or other disposable materials in the work area.

11. Properly remove PPE outside, avoiding contact with contaminated surfaces of suit, gloves, etc., and dispose immediately.

NOTES

1-2 EXTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP

Follow CSPM 600 for training & documentation requirements





BEFORE

✗ Homes built before 1978 have the potential for lead paint and require special considerations during retrofitting.

AFTER

✓ Detailed attention needs to be paid to every aspect of work with lead-based paint, from start to finish.

IMPORTANT

This section does not replace EPA Lead Renovation, Repair, and Painting (RRP) training or certification. Compliance with EPA handling and safety requirements is mandatory.

PPE



** Situation dependent. ** Weather dependent.*

TOOLS

- HEPA vacuum.
- Hand tools.
- Shrouded power tools.
- Half or full-face respirator (fit-tested).

MATERIALS

- 6-mil plastic sheeting.
- Catchment poly bags.
- Signage.
- Tack pads.
- Painters tape.
- Trash bags.
- Scaffolding.
- Disposable Tyvek suits.
- Booties.
- Nitrile gloves.
- P-100 filters.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

1-2 EXTERIOR LEAD-SAFE WEATHERIZATION



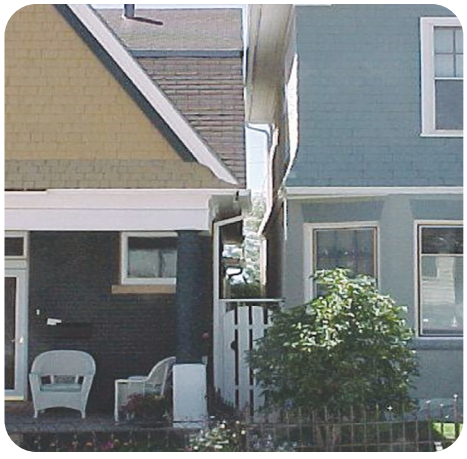
1. Create containment area with plastic sheeting 10 feet in any direction from work area.



2. Post signs at least 20 feet from work area to prevent anyone from entering work area unintentionally.



3. Seal off all exterior access points to home within containment area, including windows, doors, mail slots and vents.



4. Where houses are located close together, vertical containment will be necessary.

CAUTION

Half and full-face respirators, required for lead renovation work, must be fit-tested on all workers at least once a year. The respirator must form a tight seal at the face and neck. Workers who have a beard cannot wear a half- or full-face respirator, since they will not form a tight seal and contaminants can bypass the respirator. Bearded workers need to wear a powered air-purifying respirator (PAPR).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

1-2 EXTERIOR LEAD-SAFE WEATHERIZATION



5. Tape plastic up onto work surface and utilize systems to catch debris while limiting damage to exterior plantings.



6. Don proper PPE, including Tyvek suit with hood, gloves, booties and half- or full-face respirator (see notes). Be aware of potential for thermal stress when working in full PPE.



7. Use hand tools or shrouded power tools to limit dispersal of contaminated dust and debris.



8. Clean work area and carefully fold and dispose of plastic sheeting.



9. Properly remove PPE outside, avoiding contact with contaminated surfaces of suit, gloves, etc., and dispose immediately.

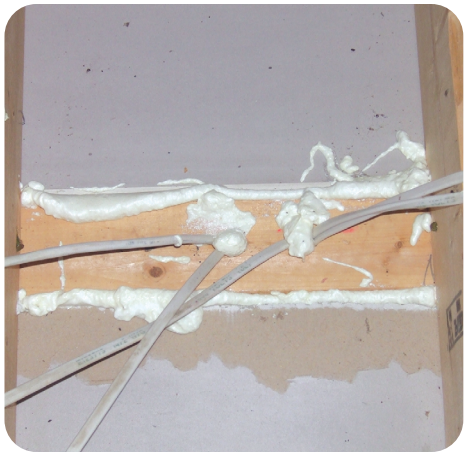
IMPORTANT

All workers disturbing painted surfaces are either certified renovators or trained by one. A certified renovator is assigned to each project and fulfills all required duties.

2-1 AIR SEAL TOP PLATES IN ATTIC

Aligns with SWS 3.0101.1, 3.0102.11





BEFORE

✗ Air can move around unsealed top plates in attic, making new insulation less effective.

AFTER

✓ Seal perimeter at all gaps and extend sealant up onto adjacent materials.

TOOLS

- Caulk gun.
- Spray foam dispensing gun.

MATERIALS

- Caulk.
- One part polyurethane spray foam.
- Mastic.

NOTES

PPE



** Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-1 AIR SEAL TOP PLATES IN ATTIC



Apply caulk to areas with gap 1/4 inch or smaller.



Apply spray foam or mastic to gaps 1/4 inch to 3 inches wide.

NOTES

REMINDER

For small holes (less than 1/4″):

If using, install backing or infill material at least 1/8″ below the surface where sealant is applied.

For medium holes (1/4″ to 3″):

Install backing or infill in or over all holes to be sealed.

For large holes (greater than 3″):

Install rigid backing or infill in or over all holes to be sealed.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

Aligns with SWS 3.0101.1, 3.0102.9





OPTION A SEAL SOFFIT INTO CONDITIONED SPACE

Soffits, coffered ceilings and other design details can create lower sections in the ceiling line and often are not sealed or insulated properly.

OPTION B SEAL SOFFIT OUT OF CONDITIONED SPACE

From the attic side, it is best to determine if it's better to leave the soffit connected to the conditioned space (inside the house) or seal it off as part of the unconditioned space.

TOOLS

- Caulk gun.
- Utility knife.
- Measuring tape.
- Drill.
- Spray foam nozzle.

MATERIALS

- Spray foam.
- Lumber for support.
- Expanded polystyrene (EPS).
- Extruded polystyrene (XPS).
- Gypsum board.
- Plywood.
- Caulk.
- Mechanical fasteners.

PPE



** Situation dependent . ** If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

OPTION A – SEAL SOFFIT INTO CONDITIONED SPACE



A-1. For openings larger than 24", support braces will be necessary.



A-2. Attach bracing across joists securely, spacing no more than 24" apart.



A-3. Apply sealant along top plates, bracing, and framing members adjacent to opening more than 24" apart.



A-4. Place Infill material over opening and secure in place with mechanical fasteners.



A-5. When support bracing has been used, screw infill material to bracing as well.

IMPORTANT

Install only non-combustible materials and sealants with an ASTM E136 listing in contact with any device producing 200 degrees F or more (chimneys, vents, flues, etc.).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

OPTION B – SEAL SOFFIT OUT OF CONDITIONED SPACE



B-1. Seal off framed openings with rigid material, such as gypsum board, XPS, EPS or OSB.



B-2. Seal around infill materials.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-3 AIR SEAL AN ATTIC CHASE OR SMALL OPENING

Aligns with SWS 3.0101.1





BEFORE

✗ Open chases for electrical and plumbing allow air movement from subspace and/or conditioned space.

AFTER

✓ When properly sealed, air movement will cease through these spaces.

NOTES

TOOLS

- Measuring tape.
- Drill.
- Utility knife.
- Caulk gun.
- Spray foam gun.

MATERIALS

- Extruded polystyrene (XPS).
- Expanded polystyrene (EPS).
- Gypsum board.
- Plywood.
- Spray foam.
- Mechanical fasteners.

PPE



** Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-3 AIR SEAL AN ATTIC CHASE OR SMALL OPENING



1. Measure the opening of the chase in a location that will maintain the pressure plane.



2. Cut material to fit for each space where it is needed, paying attention to locations of wires and pipes.



3. Rigid material to cover the span can be XPS, EPS, gypsum board or plywood, as appropriate for the location.



4. Seal rigid material into place securely and air seal with caulk, spray foam or mastic.



5. Extend sealing to adjacent materials to ensure a complete air seal.

REMINDER

Install support material for spans wider than 24", except when air barrier material is rated to span greater distance under load (e.g., wind, insulation).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-4 AIR SEAL BALLOON FRAMING FROM ATTIC

Aligns with SWS 3.0101.1, 3.0102.4



BEFORE

✗ Balloon framing leaves cavities open from the basement to the attic, allowing for large amounts of air movement.



AFTER

✓ By sealing at the top of the cavity, air flow is stopped and the cavity below is another step closer to being ready to insulate.

TOOLS

- Measuring tape.
- Drill.
- Utility knife.
- Saw.
- Spray foam gun.
- Caulk gun.

MATERIALS

- Extruded polystyrene (XPS).
- Gypsum board.
- Plywood.
- Plastic-wrapped/bagged fiberglass batts.
- Spray foam.
- Caulk.
- Mastic.
- Mechanical fasteners .

PPE



** Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-4 AIR SEAL BALLOON FRAMING FROM ATTIC



1. Block the opening of balloon framed sidewalls in alignment with the pressure boundary.



2. Blocking material options include lumber, gypsum board, XPS or bagged fiberglass batts.



3. Blocking material needs to be appropriate for potential weight load.



4. Securely fasten rigid material to withstand pressure of dense packing beneath.



5. Seal any remaining gaps with caulk or one part spray foam, extending sealing to adjacent materials.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-5 SEAL INSULATION-CONTACT RATED CAN LIGHTS

Aligns with SWS 3.0101.1





BEFORE

✗ Insulation contact rated can lights are commonly installed in the ceiling between the upper story and the attic, meaning gaps around them allow for significant air leakage.

AFTER

✓ By sealing around an IC-rated can light, a continuous pressure boundary is maintained.

IMPORTANT

Lights will indicate insulation rating on the side traditionally with "Type IC".

PPE



** Weather dependent.*

TOOLS

- Caulk gun.

MATERIALS

- Caulk.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-6 SEAL ELECTRICAL AND OTHER PENETRATIONS IN ATTIC

Aligns with SWS 3.0101.1, 6.0201.1, 6.0201.2



1. Electrical, plumbing and HVAC penetrations are often oversized. Other penetrations may include kitchen range hoods and exhaust fans.



2. For smaller gaps, caulk is enough to seal the hole.

TOOLS

- Caulk gun.
- Spray foam gun.
- Utility knife.

MATERIALS

- Caulk.
- Spray foam.
- Backer rod.

NOTES

PPE



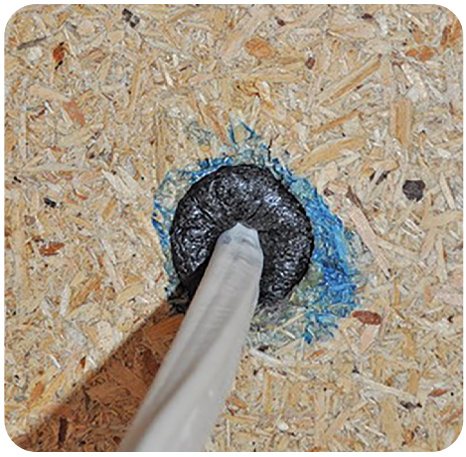
** Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-6 SEAL ELECTRICAL AND OTHER PENETRATIONS IN ATTIC



3. Holes larger than 1/4 inch may require support for the sealant.



4. Inserting backer rod provides infill to support the sealant.



5. Seal to cover entire opening, including all backer rod.

NOTES

REMINDER

For gaps larger than 3", see Section 2-3 Air Seal an Attic Chase or Small Opening.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-7 AIR SEAL A FLOORED ATTIC

Aligns with SWS 3.0101.1





BEFORE

✗ Check floor joist cavities for blocking material and penetrations.

AFTER

✓ Air seal cracks and penetrations in floored attic spaces.

IMPORTANT

Spray foam will not be used when exposed to habitable living spaces.

TOOLS

- Saw.
- Drill.
- Measuring tape.
- Utility knife.
- Caulk gun.
- Spray foam gun.

MATERIALS

- Caulk.
- Extruded polystyrene (XPS).
- Lumber.
- Gypsum board.
- One part spray foam.
- Mechanical fasteners.
- Backer rod.

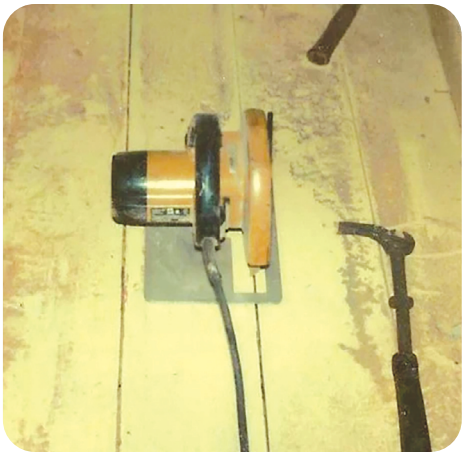
PPE



** Situation dependent. ** If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

2-7 AIR SEAL A FLOORED ATTIC



1. With property owner permission, remove flooring material to access cavities.



2. Remove only as much flooring as necessary to gain access to every cavity and any large air sealing areas.



3. Place blocking material, as needed, and air seal to hold insulation in place.



4. In rare cases it may be easier to access blocks from below floored attic spaces.



5. Air seal gaps and seams in joist cavities as accessible.



6. Check for and air seal electrical, plumbing, and HVAC penetrations properly.

Photo credits: REUK.co.uk – After; Home Insulation of Syracuse – Step1 and Step 2

3-1 SEAL AROUND CHIMNEYS AND FLUES

Aligns with SWS 3.0101.1, 3.0102.2





BEFORE

✗ Even high-temperature sites need air sealing.

AFTER

✓ Maintain 3 " of clearance from the flue for all combustible materials.

TOOLS

- Caulk gun.
- Metal snips or nibbler.
- Drill.
- Tape measure.

MATERIALS

- 26 - gauge sheet metal.
- Mechanical fasteners.
- Lumber.

PPE



** Situation dependent . ** If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

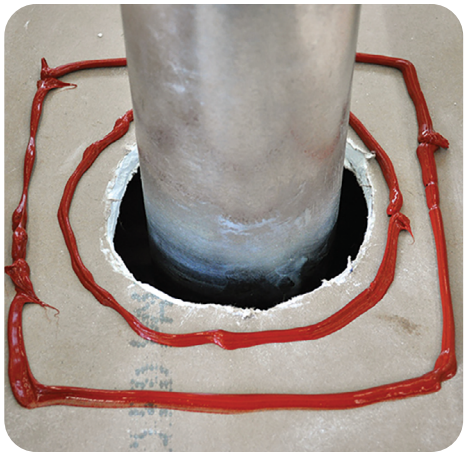
3-1 SEAL AROUND CHIMNEYS AND FLUES



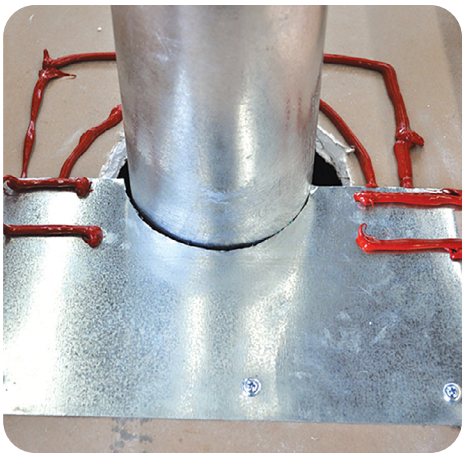
1. Select an ASTM E136 high-temperature caulk sealant that will adjust to temperature differences between materials.



2. Apply unbroken ring of caulk directly to clean decking around entire perimeter of flue or chimney.



3. Apply unbroken ring of caulk directly to clean decking to match perimeter of sheet metal backing.



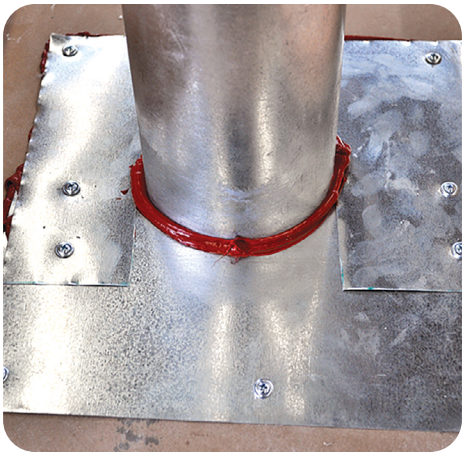
4. Install first layer of metal sheeting and apply additional caulk to complete new perimeter for second layer of sheeting.

IMPORTANT

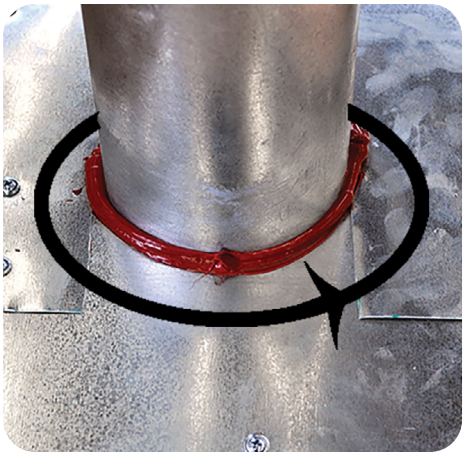
Install only noncombustible materials and sealants with an ASTM E136 listing in contact with any device producing 200 degrees F or more (chimneys, vents, flues, etc.).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

3-1 SEAL AROUND CHIMNEYS AND FLUES



5. Set second layer of sheeting to complete ring around flue or chimney. Fasten sheeting mechanically.



6. Run a bead of ASTM E136 high-temperature caulk around flue at backing to seal remaining gaps < 1/4".



7. Create a durable, fixed dam, at least 2" higher than final insulation level, keeping all combustible materials at least 3" away from flue or chimney.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

3-2 SEAL AROUND NON-INSULATION CONTACT-RATED (NON-IC) CAN LIGHTS

Aligns with SWS 3.0102.1





BEFORE

✗ Non-insulation contact-rated can lights create a fire hazard in well-insulated attics. Installing an LED bulb in a non-IC rated fixture does not change the rating of the fixture or the need for an airtight enclosure.

AFTER

✓ When boxed with appropriate clearances and fire-rated materials, fire risk is mitigated.

TOOLS

- Measuring tape.
- Utility knife.
- Caulk gun.

MATERIALS

- 5/8 Inch gypsum board.
- ASTM E136 high temperature caulk.
- 100% silicone sealant.

PPE

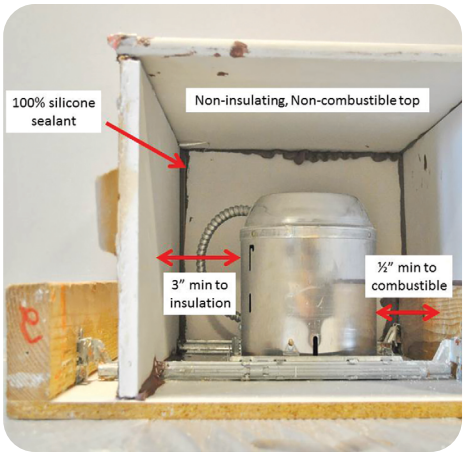


** Situation dependent .*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

3-2 SEAL AROUND NON-INSULATION CONTACT-RATED (NON-IC) CAN LIGHTS







1. Clear any debris from around non-IC-rated can light.

2. Enclosure has 3 " of clearance from lamp to insulation on all sides, at least 1/2 " from any combustible material, such as wood.

3. Premade boxes can make installation easier when installation site is clear of framing members.

IMPORTANT

Non "insulation contact" can lights are designed to vent heat from the lamp into the cavity around them. They are safe to use in non-insulated cavities, such as the ceiling/floors between different stories in a home. IC-rated can lights have a secondary housing to keep the heat of the lamp from contacting the insulation. They are also recommended for use with lower wattage lamps.

3-2 SEAL AROUND NON-INSULATION CONTACT-RATED (NON-IC) CAN LIGHTS



4. Seal box on all sides and edges to make continuous barrier from attic, using high temp caulk where appropriate.



5. Top of box must be R-1 or less and left free of insulation. Flag enclosure for added visibility.

REMINDER

There is also the option of replacing old can lights with air-tight units or LED retrofit inserts. Check program requirements and install all lighting to manufacturer specs and applicable code.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

4-1 PREPARE ATTIC FLOOR FOR INSULATION

Aligns with SWS 4.0103.1, 4.0103.2, 4.0103.3, 4.0103.4, 4.0103.5, 4.0103.6, 4.0103.7, and 4.0103.8

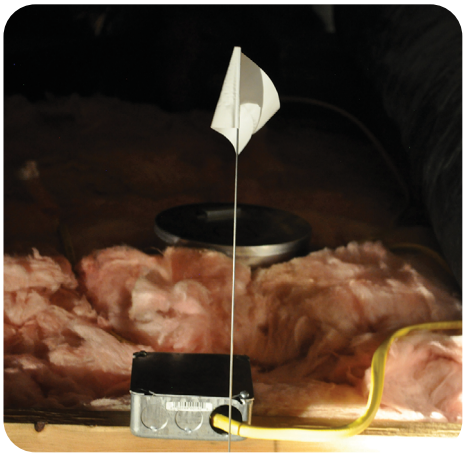
BEFORE YOU BEGIN





✓ Check for live knob and tube wiring, dam off when possible, or replace with modern wiring.





✓ Cover junction boxes and securely fasten markers or flags at all utility junctions so they may be seen above the final level of the insulation.

TOOLS

- Non-contact tester.
- Utility knife.
- Drill.
- Hole saw.
- Caulk gun.
- Staple gun.
- Metal snips.
- Nibbler.

REMINDER

Knob-and-tube can be replaced by a qualified professional.

PPE



** If cutting lumber or sheet metal . ** Situation dependent. *** If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

4-1 PREPARE ATTIC FLOOR FOR INSULATION



1. Remove stored materials.



2. Run exhaust fan ducts to outside, insulate to R-8.



3. Ensure air sealing, if any, is completed.



4. Install baffles, if needed. Ensure 2 " of gap for airflow and ensure baffles extend a minimum of 6" beyond the final insulation level.

MATERIALS

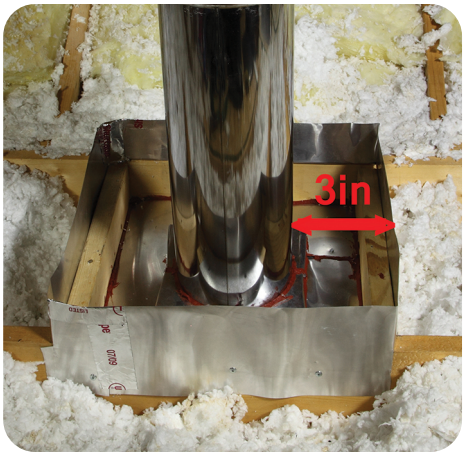
- Plywood.
- Drywall.
- Extruded polystyrene (XPS).
- Junction box covers.
- Flags.
- Vent caps.
- Rigid duct.
- Mechanical fasteners.
- Foil tape.
- R-8 duct insulation.
- Soffit baffles.
- Depth rulers.
- 26 - gauge steel sheeting.
- ASTM E136 high temperature caulk.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

4-1 PREPARE ATTIC FLOOR FOR INSULATION



5. Depth rulers installed, 1 per 300 square feet.



6. All dams are built, as needed.



7. Ensure all health & safety concerns have been addressed before insulation is installed (such as roof leaks, structural damage, electrical concerns, etc.).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

5-1 DAM, SEAL & INSULATE AN ATTIC HATCH

Aligns with SWS 3.0103.1





BEFORE

✗ Uninsulated attic access points allow conditioned air to escape the home in all seasons.

AFTER

✓ Safely and durably sealing and insulating attic access doors prevent air movement and reduces heating and cooling loads.

TOOLS

- Measuring tape.
- Saw.
- Drill.
- T-square.
- Utility knife.
- Caulk gun.

MATERIALS

- Lumber.
- Mechanical fasteners.
- Extruded polystyrene (XPS) or other rigid foam insulation board.
- Foam tape.
- Adhesive.
- Latch (optional).

PPE



** If cutting lumber . ** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

5-1 DAM, SEAL & INSULATE AN ATTIC HATCH



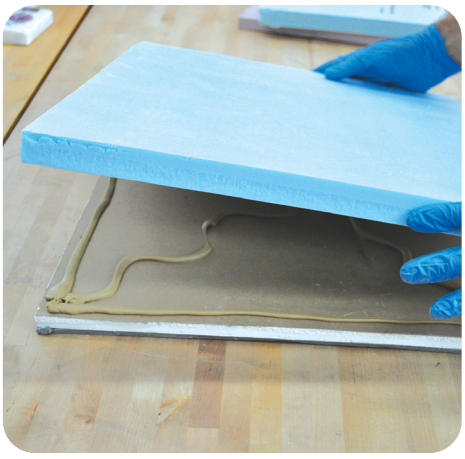
1. Rigid, durable attic hatch blocking/dam is installed in a permanent way.



2. Dam is at least 2 " taller than the final attic insulation depth.



3. Cut gypsum board to hatch size for "friction fit" and air seal bottom of hatch with unbroken ring of foam tape.



4. Cut and stack rigid foam insulation, gluing with appropriate adhesive, to build up R-value to adjoining assembly.

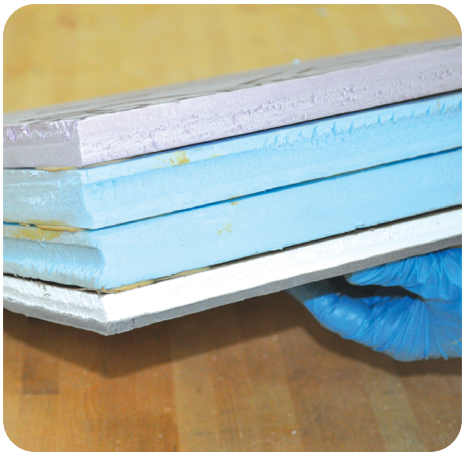
REMINDER

Permanently fasten insulation to access in complete contact with the air barrier.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

5-1 DAM, SEAL & INSULATE AN ATTIC HATCH







5. Hatch is insulated to proper R-value (the maximum R-value structurally allowable, up to the final insulation level of surrounding attic).

6. Trim is air-sealed with appropriate material.

7. For vertical accesses, run weatherstripping or foam tape to air seal. Hold vertical accesses closed with latch if necessary.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

5-2 DAM, SEAL & INSULATE A PULL-DOWN ATTIC STAIRWAY

Aligns with SWS 3.0103.1





BEFORE

✗ Pull-down stairs can be a weak point in thermal/pressure boundaries, as well as creating a place where insulation can fall into the home.

AFTER

✓ Attic pull-down stairs are safely and durably sealed and insulated to prevent air movement.

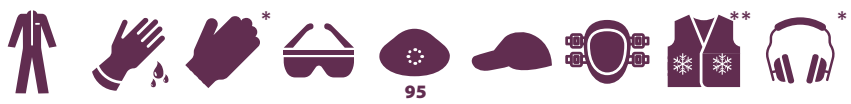
MATERIALS

- Extruded polystyrene (XPS).
- Expanded polystyrene (EPS).
- Polyiso.
- Plywood.
- One part spray foam.
- Spray adhesive.
- Caulk adhesive.
- Foil tape.
- Mechanical fasteners.
- Foam tape.
- Weatherstripping.
- Latches.

TOOLS

- Measuring tape.
- Utility knife.
- Saw.
- Caulk gun.
- Spray foam gun.
- Drill.

PPE



** If cutting lumber. ** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

5-2 DAM, SEAL & INSULATE A PULL-DOWN ATTIC STAIRWAY



1. Build cover above and around pull-down stairs, taller than final insulation height.



2. Insulate top and sides of dam cover, to adjoining assembly R-value.



3. Air seal all edges of trim.



4. Air seal with foam tape or weatherstripping.



5. Install latches to ensure hatch remains closed and air sealed if it does not remain closed with a 'friction fit'.

REMINDER

Permanently fasten insulation to access in complete contact with the air barrier.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

6-1 INSULATE AN UNFLOORED ATTIC

Aligns with SWS 4.0103.2, 4.0103.4, 4.0103.5





BEFORE

Ensure attic prep work has been completed before starting installation (See 4-1 Prep Attic Floor for Insulation).

AFTER

FINAL CHECKLIST

- ✓ Appropriate insulation material used.
- ✓ Correct depth, as specified in work order.
- ✓ Insulation level is even.

TOOLS

- Measuring tape.
- Insulation machine.
- Staple gun.

MATERIALS

- Loose fill fiberglass or cellulose (as per work order).
- Staples.

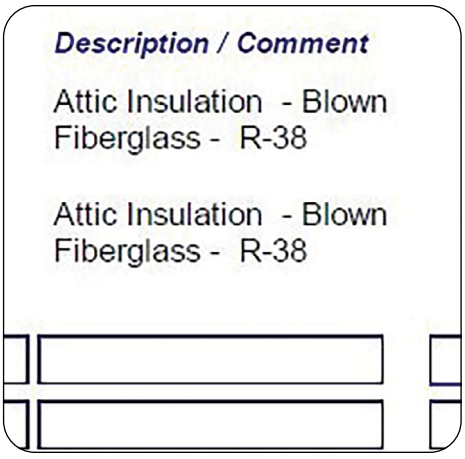
PPE

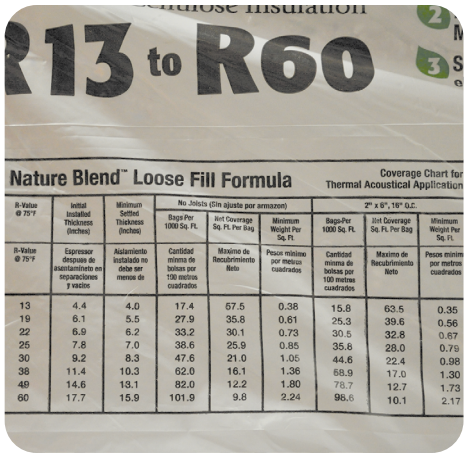


** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

6-1 INSULATE AN UNFLOORED ATTIC







1. Verify against work order that correct insulation material is installed.

2. Verify insulation depth/density against manufacturer's density chart.

3. While installing, regularly check depth of insulation for even coverage and to meet required depth.





4. Ensure insulation does not get into dammed-off areas, such as around chimneys and flues and inside soffit baffles (See 3-1 Chimneys and flues).

5. Complete insulation certificate and post at the electrical panel (See appendix A-5).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

6-2 INSULATE UNDER A FLOORED ATTIC

Aligns with SWS 4.0103.6



BEFORE

✗ Attics with flooring often hide uninsulated cavities.



AFTER

✓ An insulated attic floor provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement.

TOOLS

- Measuring tape.
- Utility knife.
- Insulation machine.
- Drill.
- Hole saw.
- Prybar.
- Caulk gun.

MATERIALS

- Loose fiberglass or cellulose insulation.
- Extruded polystyrene (XPS).
- Caulk.
- Mechanical fasteners.
- Gypsum board.
- Plugs.

PPE



** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

6-2 INSULATE UNDER A FLOORED ATTIC



1. Ensure floor cavities are blocked securely at both ends.



2. If boards can be loosened, pry up as few boards as possible to access all cavities. If flooring is in solid sheets, access holes may need to be drilled.



3. Fill entire cavity with insulation to prescribed density per manufacturer's specifications.

NOTES



4. Homeowners may not want the attic floor to be disturbed. Cavities can be accessed from below through the ceiling, particularly in garage spaces.

6-2 INSULATE UNDER A FLOORED ATTIC



5. Blocking still needs to be put into place.



6. Blow insulation to completely fill cavities to prescribed density per manufacturer's specifications.



7. Fill and reseal access holes to prevent air movement.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

Photo credit: Home Insulation of Syracuse – After

6-3 INSULATE AN ATTIC STAIRWAY

Aligns with SWS 4.0104.1, 4.0104.2, 4.0104.3, 4.0104.4, 4.0104.5, 4.0104.6, 4.0201.2, 4.0201.3, 4.0202.1



BEFORE

✗ Attic stairways can offer a unique set of insulation challenges. Clearly define where the thermal and pressure boundary are going to be located before starting insulation.



AFTER

✓ Insulation provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement between the attic and the remainder of the home.

TOOLS

- Measuring tape.
- Drill.
- Utility knife.
- Hole saw.
- Insulation machine.
- Spray foam gun.

MATERIALS

- Kraft-faced fiberglass batts.
- Loose cellulose or fiberglass insulation.
- Netting.
- Furring strips.
- Staples.
- Mechanical fasteners.
- Extruded polystyrene (XPS).
- Two part spray foam.
- One part spray foam.
- Plywood.
- Gypsum board.
- House wrap.

PPE



** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

6-3 INSULATE AN ATTIC STAIRWAY



1. If walls are accessible from the attic side, choose between batt or blown-in insulation.



2. Block off open cavities along the line of the thermal/pressure boundary.



3. Air seal around blocking material.



4. Cut batts to size for each individual cavity, ensuring no gaps remain, locating kraft-paper toward conditioned space.



5. For batt insulation, cover installed batts with backing. For blown-in, attach netting to framing members, cut holes in netting and blow in insulation to prescribed density per manufacturer's specifications.



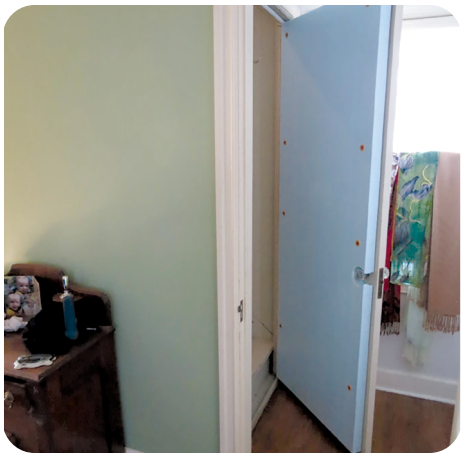
6. If walls are enclosed from attic side, drill holes in stairways walls.

Photo credit: Home Insulation of Syracuse – after, steps 8, 11 and 12

6-3 INSULATE AN ATTIC STAIRWAY



7. Dense pack stairway walls.



8. Weatherstrip and insulate door.



9. Insulate under stairway using insulation indicated by work order.



10. Seal off insulation from conditioned space in home.



11. If backside of stairs is already sealed, blow insulation into cavity behind stairs.



12. Plug access holes for blown insulation.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

If insulating and air sealing at the top of the stairwell, see section 5-1.

7-1 PREPARE A MANUFACTURED HOME CEILING FOR INSULATION

Aligns with SWS 4.0103.6, 4.0103.9, 4.0103.10, 4.0103.11, 4.0103.12





BEFORE YOU BEGIN

Make any repairs and preparation as noted from assessment, as well as fixing any new issues that could cause the ceiling to be compromised with the additional weight of insulation.

AFTER

FINAL CHECKLIST

- ✓ Vents all terminate to outside and are properly sealed.
- ✓ Flues are dammed properly.
- ✓ Ceiling is in good condition to hold weight.

TOOLS

- Non-contact tester.
- Utility knife.
- Drill.
- Hole saw.
- Caulk gun.
- Staple gun.
- Metal strips.
- Nibbler.

MATERIALS

- Caulk.
- Mechanical fasteners.
- Drywall.
- Foil tape.
- ASTM E136 high temperature caulk.
- Mastic.

PPE



**If working with mold. **Weather dependent. ***If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-1 PREPARE A MANUFACTURED HOME CEILING FOR INSULATION



1. Ensure plumbing and exhaust vents terminate outside.



2. Dam around high temperature flues (note: flue in image is in need of work).



3. Replace non-IC rated can lights with IC-rated cans or LED retrofits.



4. Repair roof leaks or other damage, as possible, or defer job if necessary.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-2 MH INSULATION: GABLE END BLOW METHOD

Aligns with SWS 4.0103.9





BEFORE

✗ Manufactured housing often does not meet regional standards for insulation.

AFTER

✓ Fill entire cavity and reseal gable ends.

TOOLS

- Drill.
- Utility knife.
- Hole saw or saws-all.
- Caulk gun.
- Insulation machine.

MATERIALS

- Fiberglass loose insulation.
- Mechanical fasteners.
- Caulk/sealant.

NOTES

PPE



** If cutting lumber.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-2 MH INSULATION: GABLE END BLOW METHOD



1. Verify integrity of ceiling to hold weight of insulation.



2. Ground blower hose to reduce chance of electrical build-up.



3. Remove or fold up gable end to access attic.



4. Insert blower hose as far as possible and then retract slowly to fill cavity entirely, on each side of marriage wall.



5. Post insulation certificate at the electrical panel (See appendix A-5).



6. Reseal gable end or install gable vent at peak that has no more than 1/2 " mesh screen. Repeat all steps from other end, if needed.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-3 MH INSULATION: EDGE BLOW METHOD

Aligns with SWS 4.0103.10





BEFORE

✗ Manufactured housing often does not meet regional standards for insulation.

AFTER

✓ Verify reinstallation and proper sealing of edge of roof to ensure no water or pest intrusion.

TOOLS

- Drill.
- Utility knife.
- Insulation machine.

MATERIALS

- Fiberglass loose insulation.
- Blocking material.
- Butyl tape.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-3 MH INSULATION: EDGE BLOW METHOD



1. Verify integrity of ceiling to hold weight of insulation.



2. Prepare stable work area to access roof edge.



3. Unfasten and remove J channel from edge of roof.



4. Clean old butyl tape or putty from J channel and store J channel somewhere safe until it can be reinstalled.



5. Remove staples holding down edge of roof.



6. Insert blocks to hold roof edge up approximately 6 ".

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

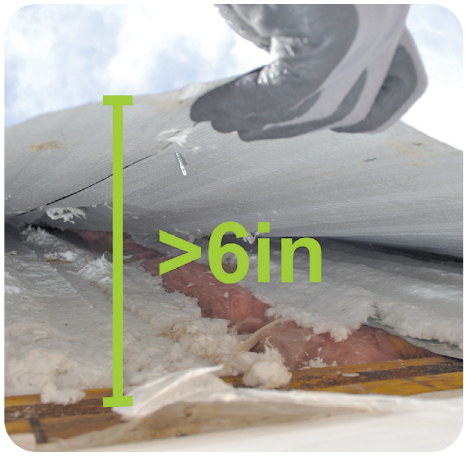
7-3 MH INSULATION: EDGE BLOW METHOD



7. Ground fill hose to reduce chance of electrical build-up.



8. Insert blower hose as far as possible into cavity and retract slowly while filling space between trusses.



9. Work down the edge of the roof until entire cavity is full.



10. Remove blocks and reattach edge of roofing over exterior sidewall paneling.



11. Replace butyl tape on J channel.



12. Reattach J channel, lapping over edge of roof. Repeat entire process for other side, if necessary.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-4 MH INSULATION: RIDGE BLOW METHOD

Aligns with SWS 4.0103.11





TOOLS

- Drill.
- Saw.
- Insulation machine.
- Caulk gun.
- Metal sheers.

BEFORE

✗ Manufactured housing commonly is under insulated, particularly older models.

AFTER

✓ After accessing from ridge, ridge cap can be installed or a series of vent caps.

MATERIALS

- Loose fiberglass insulation.
- Sealant.
- 26 - gauge metal sheeting.
- Vent caps.
- Mechanical fasteners.
- Elastomeric coating.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-4 MH INSULATION: RIDGE BLOW METHOD





1. Remove ridge cap or cut access holes at ridge, leaving one side attached to put back in place.

2. Insert blower hose.





3. Fill all accessible areas.

4. If not installing ridge or cap vents, replace flaps, patch over with metal, and install elastomeric sealant.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-5 MH INSULATION: INTERIOR BLOW METHOD

Aligns with SWS 4.0103.12



1. Drill holes in ceiling to fill each ceiling joist cavity.



2. Blow insulation into ceiling cavity according to work order specifications.

TOOLS

- Hole saw.
- Vacuum.
- Insulation machine.
- Caulk gun.

MATERIALS

- Fiberglass loose insulation.
- Plugs.
- Sealant.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-5 MH INSULATION: INTERIOR BLOW METHOD



3. Continue throughout house to ensure even coverage without gaps.



4. Seal all holes securely.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

TECH TIP

You can install a piece of painted trim to conceal the holes that were drilled.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-6 MH INSULATION: TOP FILL BLOW METHOD

Aligns with SWS 4.0103.11





BEFORE

✗ Attics in older manufactured houses are often under insulated or poorly insulated.

AFTER

FINAL CHECKLIST

✓ Provide continuous and safe thermal barrier.

✓ Protect integrity of roof.

TOOLS

- Saw.
- Insulation machine.
- Caulk gun.
- Paint brush.
- Drill.

MATERIALS

- Fiberglass loose insulation.
- All-weather adhesive.
- Sheet metal.
- Mechanical fasteners.
- Elastomeric paint.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

7-6 MH INSULATION: TOP FILL BLOW METHOD



1. Drill or cut uniform access holes in the roof spaced to access the entire roof cavity.



2. Blow insulation into attic cavity to capacity.



3. Run a continuous bead of flexible and durable all-weather adhesive around the access hole.



4. Install a durable metal patch of equal or greater gauge than the roof material that overlaps the opening at least 2 " on all sides, and fastening in place every 2 " along perimeter.



5. Apply elastomeric paint over patch that laps at least 6 " on all sides to create a continuous seal.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-1 AIR SEAL ABOVE THE KNEE WALL

Aligns with SWS 3.0101.1, 3.0102.11





BEFORE

✗ Thermal and pressure boundary are not aligned.

AFTER

✓ Air sealing the knee wall from above continues the pressure boundary while supporting future insulation.

TECH TIP

A combination of spray foam and backing material may be used in place of XPS foam board.

PPE



** If cutting lumber. ** Situation dependent.*

TOOLS

- Measuring tape.
- Utility knife.
- Saw.
- Drill.
- Caulk gun.
- Spray foam gun.

MATERIALS

- Extruded polystyrene (XPS).
- Plywood.
- Gypsum board.
- Lumber.
- Mechanical fasteners.
- Caulk.
- Spray foam.
- Mastic.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-1 AIR SEAL ABOVE THE KNEE WALL



1. After clearing away debris, measure gap above knee wall in line with pressure boundary.



2. Cut blocking material (XPS, wood, gypsum board) to fit gap.



3. Securely fit infill or blocking material in place.



4. Ensure blocking material is located in line with preferred pressure boundary.



5. Secure in place with mechanical fasteners or adhesive as necessary to prevent movement when insulation is installed.



6. Seal continuously around blocking material to preserve pressure boundary.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-2 AIR SEAL BENEATH THE KNEE WALL

Aligns with SWS 3.0101.1





BEFORE

✗ Knee walls are part of the thermal and pressure boundary.

AFTER

✓ Air sealing from below allows areas of the attic floor to be treated separately according to whether they fall in or out of the pressure boundary.

TOOLS

- Measuring tape.
- Utility knife.
- Saw.
- Drill.
- Caulk gun.
- Spray foam gun.

MATERIALS

- Extruded polystyrene (XPS).
- Plywood.
- Gypsum board.
- Lumber.
- Mechanical fasteners.
- Caulk.
- Spray foam.
- Mastic.



** If cutting lumber. ** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-2 AIR SEAL BENEATH THE KNEE WALL



1. After clearing away debris, measure gap below knee wall in line with pressure boundary.



2. Cut blocking material (XPS, wood, gypsum board) to fit gap.



3. Securely fit infill or blocking material in place.



4. Ensure blocking material is located in line with preferred pressure boundary.



5. Seal continuously around blocking material to preserve pressure boundary.

TECH TIP

A combination of spray foam and backing material may be used in place of XPS foam board.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-3 INSULATE AN ATTIC KNEE WALL WITH BATTS

Aligns with SWS 4.0104.2, 4.0104.3



BEFORE

✗ Uninsulated air sealed knee walls are ready for insulation.



AFTER

✓ Once insulated, this knee wall provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement.

TOOLS

- Measuring tape.
- Utility knife.
- Staple gun.

MATERIALS

- Fiberglass batts.
- Staples.
- Nylon strap.
- Mechanical fasteners.
- House wrap.
- Radiant barrier.

PPE



** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-3 INSULATE AN ATTIC KNEE WALL WITH BATTS



1. Measure cavities.



2. Cut batts for exact fit.



3. Install batts with minimal compression.



4. Install an airtight vapor permeable backing material in full contact with the existing cavity insulation. Secure backing material using mechanical fasteners that penetrate the sub framing a minimum of 1".

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-4 INSULATE AN ATTIC KNEE WALL WITH 2-PART SPRAY FOAM

Aligns with SWS 4.0104.5, 4.0104.6





BEFORE

✗ Air seal large gaps before applying spray foam insulation to prevent foam from leaking into conditioned space.

AFTER

✓ Spray foam insulation installed evenly to ensure consistent R-value and air sealing.

TOOLS

- Spray foam gun.
- Fit-tested respirator or PAPR.
- Measuring tape.
- Utility knife.
- Drill.

MATERIALS

- Two part spray foam.
- Low-perm paint.
- Polyisocyanurate.
- Expanded polystyrene (EPS).
- Gypsum board.
- Mechanical fasteners.
- Joint tape.
- Joint compound.

PPE



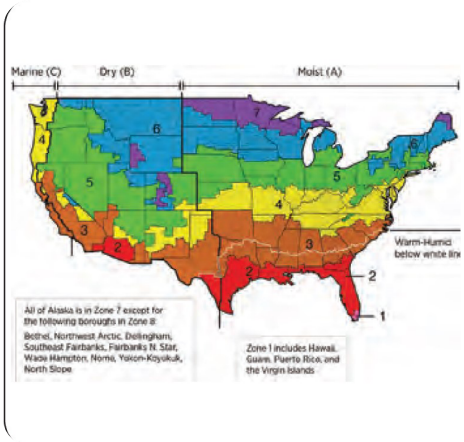
** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

8-4 INSULATE AN ATTIC KNEE WALL WITH 2-PART SPRAY FOAM



Ensure proper PPE when installing two part spray foam.



For climate zones 5-8, install foam to a thickness of at least a class II vapor retarder or install a class II vapor retarder, such as fiber-faced polyiso, unfaced EPS or low-perm paint.



If space is used for utility access, storage, or permanently habitable, separate foam from the subspace with a suitable thermal barrier covering, such as 1/2" gypsum board.

REMINDER

- Spray foam should be installed per manufacturer's specifications. Refer to product ICC_ES report when installing spray foam insulation.
- Post insulation certificate at the electrical panel (See appendix A-5).

Photo credit: Tracy Helgeson – third photo from left

8-5 INSULATE AN ATTIC KNEE WALL WITH BLOWN INSULATION

Aligns with SWS 4.0104.1



BEFORE

✗ Air sealed knee walls are ready for insulation.



AFTER

✓ Once insulated, this knee wall provides a continuous, contiguous, safe and compliant thermal boundary that prevents air movement.

TOOLS

- Measuring tape.
- Utility knife.
- Drill.
- Staple gun.
- Hole saw.
- Insulation machine.

MATERIALS

- Extruded polystyrene (XPS).
- Gypsum board.
- House wrap.
- Radiant barrier.
- Mechanical fasteners.
- Furring strips.
- Loose fiberglass insulation.

PPE



** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.
"After" photo credit: Home Insulation of Syracuse

8-5 INSULATE AN ATTIC KNEE WALL WITH BLOWN INSULATION



1. Securely install backing material over entire knee wall.



2. Cut holes in backing material to allow access to all cavities.



3. Blow insulation into cavities to meet dense-pack standards.



4. Fill all cavities.



5. Replace access hole plugs in backing material, if possible.



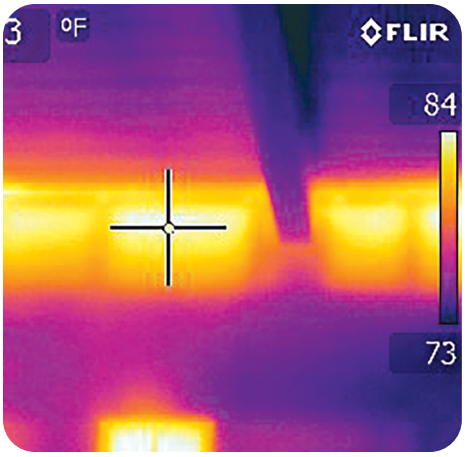
6. Seal access holes permanently and completely.

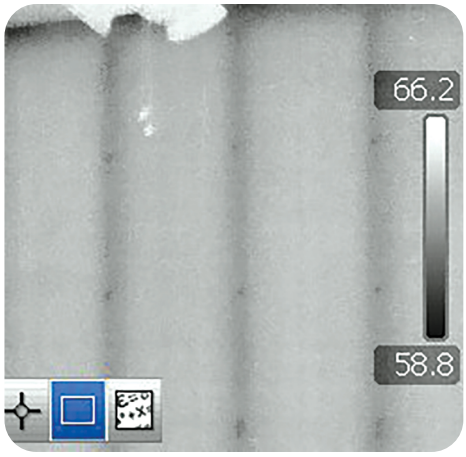
REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW

Aligns with SWS 4.0202.1





BEFORE

✗ Walls that are missing insulation or under insulated are an opportunity for energy savings.

AFTER

✓ When properly insulated, walls will allow minimal heat and air transfer.

NOTES

PPE



TOOLS

- Measuring tape.
- Utility knife.
- Pry-bar.
- Siding remover.
- Hole saw.
- Drill.
- Insulation machine.

MATERIALS

- Plastic sheeting.
- Painters tape.
- Loose cellulose or fiberglass insulation.
- Plugs.
- Caulk.
- Spray foam.
- Mechanical fasteners.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

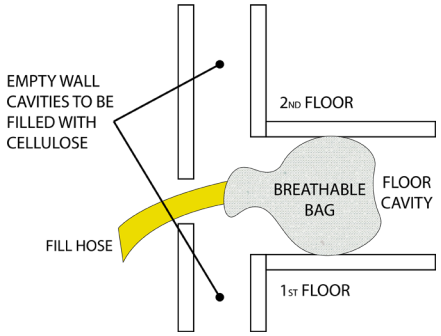
9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW



1. Protect work area from debris and dirt.



2. Ensure balloon-framed walls are blocked at top and bottom.



3. When encountering 2-story houses with wall-floor junctions, fill a breathable bag with insulation to plug the floor cavity and keep insulation in place.



4. Ensure wall integrity is complete (no holes).



5. Remove siding as needed.



6. Probe wall cavities before filling, to identify obstacles and cavity dimensions.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW



7. Drill holes as required based on building frame design and exterior materials.



8. Fill cavities completely and to proper density.



9. If possible, ensure all cavities are filled before completing job.



10. Patch holes.



11. Replace and/or repair siding.

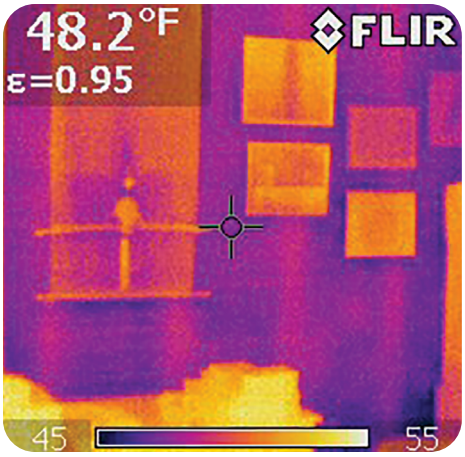
REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW

Aligns with SWS 4.0202.1





BEFORE

✗ Older houses often lack insulation.

AFTER

✓ Inconspicuous capped, patched, or covered holes are ideal.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

PPE



TOOLS

- Measuring tape.
- Utility knife.
- Hole saw.
- Drill.
- Insulation machine.
- Infrared camera.

MATERIALS

- Plastic sheeting.
- Loose cellulose or fiberglass insulation.
- Gypsum board.
- Joint compound.
- Caulk.
- Mechanical fasteners.
- Chair rail.
- Plugs.
- Painters tape.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW



1. Protect work area from debris and dust.



2. Ensure balloon-framed walls are blocked at top and bottom.



3. Ensure wall integrity is complete (no holes).

NOTES

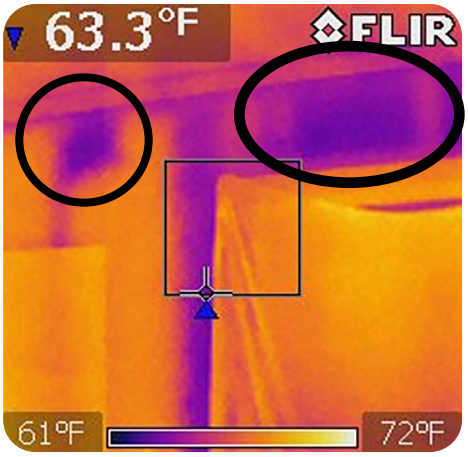


4. Drill holes as required based on building design.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW







5. Fill cavities completely and to proper density per manufacturer specifications.

6. If possible, ensure all cavities are filled before completing job (note: dark areas were missed).

7. Patch holes to match original interior surface characteristics. Use trim if preferred.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS

Aligns with SWS 4.0202.3





BEFORE

✗ Manufactured housing sidewalls present a unique challenge when it comes to insulation.

AFTER

✓ Properly installed insulation will have no gaps and compressed as little as possible.

TOOLS

- Drill.
- Measuring tape.
- Utility knife.
- Batt stuffer.

MATERIALS

- Wrapped fiberglass batts.
- Mechanical fasteners.

PPE

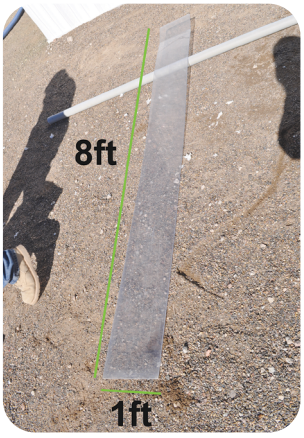


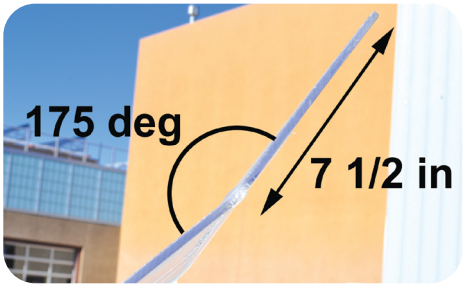
** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

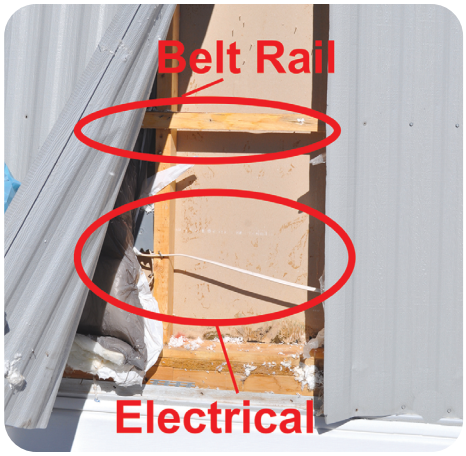
10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS

BEFORE YOU BEGIN





Prepare insulation stuffer, if necessary.



1. Remove siding as needed, starting from bottom and taking note of any obstacles that may compress insulation.



2. Measure cavity size.



3. Plastic-wrapped fiberglass batts provide both insulation value and vapor retarder for unsealed cavities.



4. Cut batt to length for cavity.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

10-1 INSULATE MANUFACTURED HOME SIDEWALLS WITH BATTS



5. Fold batt over end of insulation stuffer.



6. Insert batt into cavity, sliding under top belt rail to top of cavity, and ease stuffer back out to allow batt to fill in space.



7. Gently tug batt into place and tuck remaining batt under lower belt rail and fit down to bottom of cavity with minimal compression.



8. Reinstall siding.



9. Reattach mechanical fasteners.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

10-2 INSULATE MANUFACTURED HOME SIDEWALLS WITH BLOWN INSULATION

Aligns with SWS 4.0202.4, 4.0202.5





BEFORE

✗ Older manufactured houses often lack insulation because they did not have to be built to a particular jurisdiction's codes.

AFTER

✓ When properly insulated, siding will not bulge or be dented from installation.

TOOLS

- Drill.
- Insulation machine.

MATERIALS

- Loose fiberglass insulation.
- Mechanical fasteners.

PPE



** Situation dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

10-2 INSULATE MANUFACTURED HOME SIDEWALLS WITH BLOWN INSULATION



1. Ensure the integrity of the wall to be insulated, both from exterior and interior.



2. Remove siding as needed, from the bottom.



3. Fill cavity with blown fiberglass insulation to a density of no more than 1.6 pounds per cubic feet, getting past belt rails and electrical.



4. Reinstall siding.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

11-1 INSTALL WEATHERSTRIPPING ON AN EXTERIOR DOOR

Aligns with SWS 3.0202.1





BEFORE

✗ Daylight visible around an exterior door indicates air infiltration.

AFTER

FINAL CHECKLIST

✓ Door opens, closes, and locks easily.

✓ Weatherstrip makes a good seal with the door.

✓ Weatherstrip does not get flattened in a way that will lead to damage when used.

TOOLS

- Measuring tape.
- Snips.
- Drill with appropriate bits.

MATERIALS

- Weatherstripping.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

11-1 INSTALL WEATHERSTRIPPING ON AN EXTERIOR DOOR



1. Measure doorway for weatherstripping.



2. Measure door top or bottom as well for weatherstripping and potential door bottom or sweep.



3. Notch upper ends of side weatherstripping to allow for top piece.



4. Fit weatherstripping snugly into rabbet, if one exists, and against other pieces.



5. Fasten weatherstripping securely when no rabbet exists.

TECH TIP

Apply a thin bead of caulk on the underside of the weatherstripping to further air seal the home.

11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

Aligns with SWS 3.0202.1





BEFORE

✗ Air and water can come in under doors when there is no door bottom or sweep.

AFTER

FINAL CHECKLIST

✓ Ensure a good seal to prevent air infiltration.

✓ Ensure unimpeded door operation.

TOOLS

- Measuring tape.
- Metal snips.
- Saw.
- Drill.
- Caulk gun.

MATERIALS

- Mechanical fasteners.
- Caulk.

TECH TIP

Door bottoms commonly are installed on new doors, those that have wooden thresholds or to replace older existing door bottoms. For houses with a rubber threshold, door sweeps are more common.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

STEPS 1-3: FOR DOOR SWEEP AND DOOR BOTTOM



1. Measure width of door and ensure door sweep is appropriate length.



2. Adjust threshold to ensure it is seated tightly.



3. Apply caulk to threshold at floor on interior, and exterior if possible.

STEPS 4-6: FOR DOOR SWEEP



4. Install door sweep on interior face of door, centering on door face.



5. Attach door sweep using mechanical fasteners.



6. Evenly place mechanical fasteners along entire length of door sweep.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

11-2 INSTALL A DOOR SWEEP OR DOOR BOTTOM ON AN EXTERIOR DOOR

STEPS 4-8: FOR DOOR BOTTOM



4. With threshold adjusted, measure door opening height.



5. Remove door from opening if height of door needs to be shortened.



6. Trim door, if possible, to ensure good fit of door bottom.



7. Trim sweep to match width of door.



8. Ensure door bottom sits tight against door and reinstall door.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-1 AIR SEAL SILL PLATE AND RIM JOIST

Aligns with SWS 3.0104.1



BEFORE

✗ Air movement around sill plates and near rim joists needs to be addressed before insulating.



AFTER

✓ Once air sealed, the cavity is ready for insulation.

TOOLS

- Spray foam gun.
- Caulk gun.

MATERIALS

- One part spray foam.
- Backer rod.
- Machine mesh.
- Steel wool.
- Caulk.

NOTES

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-1 AIR SEAL SILL PLATE AND RIM JOIST



1. For exterior holes larger than 1/4", steel wool or other pest blocking material before sealing.



2. Cut backing material to fill space.



3. Seal over to hold backing material in place and air seal.



4. Seal penetrations on subfloor as well, looking out for current electrical, plumbing and vacated holes.



5. Push sealant into seams where framing members meet.



6. Create a continuous seal on all seams.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-2 INSULATE RIM JOIST

Aligns with SWS 4.0401.1, 4.0401.2, 4.0401.3





BEFORE

✗ Basement and crawlspace rim joists must be addressed when part of the thermal boundary.

AFTER

✓ Foam products require a thermal barrier or coating, such as 1/2 " gypsum board, to separate them from permanently habitable spaces.

TOOLS

- Measuring tape.
- Utility knife.
- Spray foam gun.
- Caulk gun.
- Drill.

MATERIALS

- Polyisocyanurate foam board.
- Plastic-wrapped fiberglass batts.
- Extruded polystyrene (XPS).
- One part spray foam.
- Two part spray foam.
- Gypsum board.
- Mechanical fasteners.
- Caulk.

PPE



** If using two-part.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-2 INSULATE RIM JOIST



1. Measure each individual cavity to be insulated and take note of obstacles for insulation.



2. Cut insulation, either rigid foam board or wrapped batts, for each cavity.



3. Ensure space is filled with no gaps or misalignment, and insulation is tight to rim joist.

REMINDER

- As long as foam is not over 3.25 " thick and space is not permanently habitable, insulation does not need to be covered by thermal barrier.
- All insulation should be installed in accordance with manufacturer specifications.
- Post insulation certificate at the electrical panel (See appendix A-5).



4. Ensure insulation is secured in place and will not move over time.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-2 INSULATE RIM JOIST



5. If foam insulation is over 3.25 " thick or space is permanently habitable, insulation needs to be covered by a thermal barrier, such as gypsum board.



6. When using wrapped or faced batts, ensure facing is to the conditioned side of the cavity and that batt is uncompressed.



7. Seal edges of the wrap or facing to surrounding surface to ensure a continuous barrier.



8. Two part spray foam can also be used as rim joist insulation.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-3 INSULATE BASEMENT WALLS IN CONDITIONED SPACE

Aligns with SWS 4.0402.4, 4.0402.5



BEFORE

✗ An uninsulated wall in a conditioned space allows the loss of conditioned air.



AFTER

✓ A sealed continuous air barrier finishes off an insulated basement wall, providing air sealing and thermal comfort.

TOOLS

- Caulk gun.
- Spray foam gun.
- Metal snips.
- Measuring tape.
- Utility knife.
- Drill.
- Staple gun.
- Taping knife.
- Mudding trowel.

MATERIALS

- Backer rod.
- Metal lath.
- Spray foam.
- Joint tape.
- Joint compound.
- Fiberglass kraft-faced batts.
- Extruded polystyrene (XPS).
- Staples.
- Gypsum board.
- Luan.
- Mechanical fasteners.
- Caulk.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-3 INSULATE BASEMENT WALLS IN CONDITIONED SPACE



1. Check wall for penetrations and seal as needed.



2. Check wall for water intrusion that needs to be mitigated first. All bulk sources of moisture should be directed away from the foundation walls.



3. If insulation has vapor retarder on only one side, install it facing the conditioned space.



4. Install insulation to prescribed R-value in full contact with the foundation wall.



5. Install a sealed air barrier on the conditioned side of the insulation. When using foam, gypsum board must be at least 1/2 " to meet building codes for a thermal barrier.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

12-3 INSULATE BASEMENT WALLS IN CONDITIONED SPACE

REMINDER

- All insulation should be installed in accordance with manufacturer specifications.
- Post insulation certificate at the electrical panel (See appendix A-5).
- Fiberglass batts or blankets are poor choices for foundation insulation due to moisture concerns.
- Sprayed fiberglass and cellulose are easily damaged by moisture, mechanical abrasion and adhesive failure.

NOTES

12-4 INSULATE CONDITIONED CRAWLSPACE WALL

Aligns with SWS 4.0402.2, 4.0402.3





BEFORE

✗ Unvented crawlspaces are sometimes considered to be part of the conditioned space, so the walls should be evaluated for insulation.

AFTER

FINAL CHECKLIST

✓ Insulation is or has class II vapor retarder.

✓ Vapor retarder faces conditioned space.

✓ Insulation laps underneath ground vapor retarder at foundation wall.

TOOLS

- Measuring tape.
- Utility knife.
- Drill.
- Spray foam gun.

MATERIALS

- Polyisocyanurate foam board.
- Nylon fasteners.
- Two part spray foam.

PPE



** If using two-part .*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

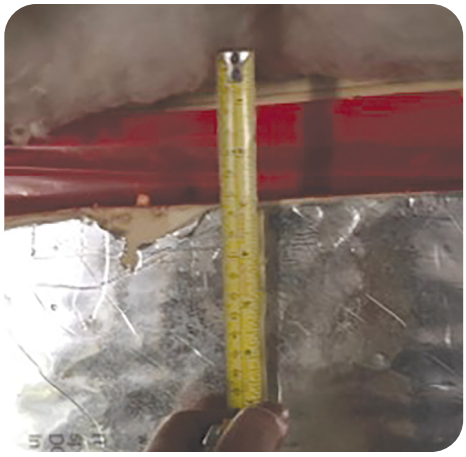
12-4 INSULATE CONDITIONED CRAWLSPACE WALL



1. Select fire safe and hydrophobic materials.



2. Attach insulation in a durable manner.



3. If termite pressure exists, add a 3 " termite inspection gap between bottom of the sill plate at the top of the insulation.



4. Two part spray foam can also be used as foundation wall insulation.

REMINDER

- Post insulation certificate at the electrical panel (See appendix A-5).
- All insulation should be installed in accordance with manufacturer specifications.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-1 AIR SEAL SMALL PENETRATIONS IN A SUBFLOOR

Aligns with SWS 3.0101.1, 3.0104.1



Many types of caulks and sealants will easily span and seal a 1/4 ” gap.



One-part spray foams can also span up to 3 ” to create an air seal.

TOOLS

- Caulk gun.
- Spray foam gun.
- Utility knife.

MATERIALS

- Caulk sealant.
- One part spray foam.
- Backer rod.

REMINDER

Spray foam may not be left exposed to habitable spaces.

PPE

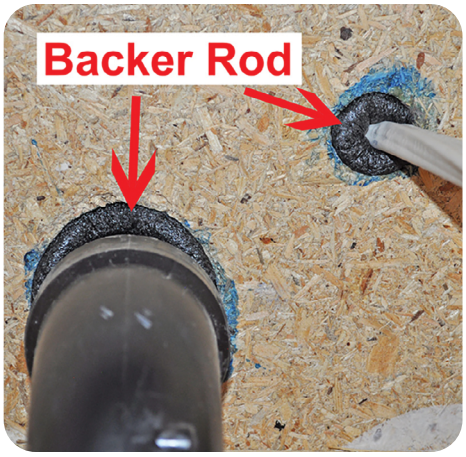


Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-1 AIR SEAL SMALL PENETRATIONS IN A SUBFLOOR



1. For small penetrations, caulk or sealant is often enough to seal the gap.



2. Use a backer rod or other infill material when sealing a gap larger than 1/4 ″ with caulk.



3. Seal over the backer rod to establish the air seal.



4. Spray foam can also be used in areas with slightly larger penetrations.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-2 AIR SEAL LARGE PENETRATIONS IN A SUBFLOOR

Aligns with SWS 3.0101.1, 3.0104.1





BEFORE

✗ Larger penetrations in the subfloor, especially plumbing chases, need to be air sealed.

AFTER

✓ Depending on the size of the gap, one-part spray foam or a combination of infill material and foam or caulk can be used.

TOOLS

- Measuring tape.
- Utility knife.
- Drill.
- Spray foam gun.
- Caulk gun.

MATERIALS

- One part spray foam.
- Two part spray foam.
- Caulk.
- Extruded polystyrene (XPS).
- Mechanical fasteners.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-2 AIR SEAL LARGE PENETRATIONS IN A SUBFLOOR



1. One-part spray foam expands to fill large holes, but needs support for holes over 5 ".



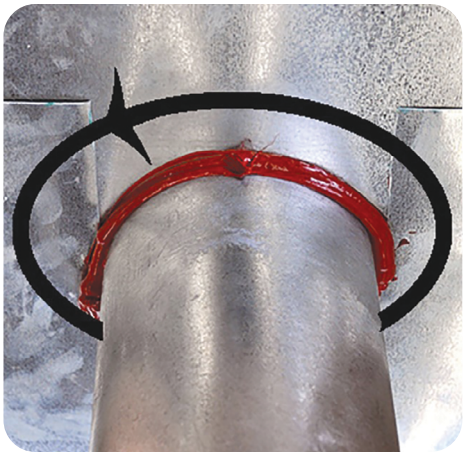
2. For larger holes, rigid infill material is needed.



3. Cut rigid infill with attention to locations of pipes and electrical.



4. Secure rigid infill in place and seal smaller gaps around infill with appropriate materials.



5. Use appropriate materials for high-temperature locations, such as around flues and chimneys.

IMPORTANT

Install only non-combustible materials and sealants with an ASTM E136 listing in contact with any device producing 200 degrees F or more (chimneys, vents, flues, etc.).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-3 AIR SEAL BALLOON FRAMING AT SUBFLOOR

Aligns with SWS 3.0101.1, 3.0102.4





BEFORE

✗ Balloon-framed walls have an open cavity that runs from the basement to the attic, allowing for large amounts of air flow via stack effect.

AFTER

✓ Securely sealing off these cavities prevents air movement, as well as providing a barrier to hold in insulation and providing fire blocking.

IMPORTANT

Spray foam will not be used in spaces that will be exposed to habitable living space.

PPE



TOOLS

- Measuring tape.
- Utility knife.
- Saw.
- Drill.
- Spray foam gun.
- Caulk gun.
- Chip brush.

MATERIALS

- Extruded polystyrene (XPS).
- Expanded polystyrene (EPS).
- Gypsum board.
- Lumber.
- Mechanical fasteners.
- One part spray foam.
- Two part spray foam.
- Caulk.
- Mastic.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

13-3 AIR SEAL BALLOON FRAMING AT SUBFLOOR



1. Measure opening.



2. Cut blocking material to fit.



3. Seal all edges with caulk, foam or mastic.

NOTES

Photo credit: InterNACHI – Before

14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE

Aligns with SWS 4.0301.1, 4.0301.6, 4.0302.1





BEFORE

✗ Uninsulated, unconditioned spaces drive down the energy efficiency of HVAC systems.

AFTER

FINAL CHECKLIST

✓ Vapor retarder faces warm side of floor.

✓ Consistent cover across subfloor.

TOOLS

- Measuring tape.
- Utility knife.
- Drill.

MATERIALS

- Kraft-faced fiberglass batts.
- Strapping.
- Netting.
- Rigid barrier such as extruded polystyrene (XPS).
- Mechanical fasteners.

PPE

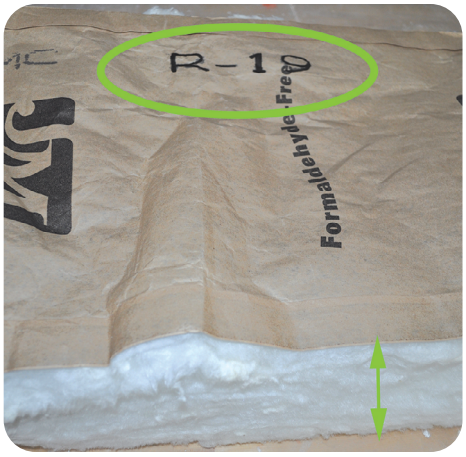


Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE



1. Ensure air sealing is complete.



2. Insulation R-value matches work order.



3. Batt vapor retarder faces warm side of floor.



4. Batts installed with no gaps.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE



5. Ensure batts have good contact with subfloor.



6. Ensure batts are held in place with physical fasteners, with minimal compression.



7. In areas where exposure to outside elements or vermin may be a concern, such as cantilevered floor joists, rigid enclosure materials must be used.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE

Aligns with SWS 4.0301.2, 4.0301.3, 4.0301.4, 4.0302.2, 4.0302.3

BEFORE YOU BEGIN



Assess air sealing opportunities and complete prior to installing insulation.

Description /Comment
Floor Insulation - Loose-fill + Rigid Barrier - R-19
Floor Insulation - Loose-fill + Rigid Barrier - R-19
Floor Insulation - Loose-fill + Rigid Barrier - R-19

Install insulation according to work order specifications.

TOOLS

- Measuring tape.
- Utility knife.
- Scissors.
- Caulk gun.
- Insulation machine.
- Pressure gauge.
- Hole saw.

MATERIALS

- Netting.
- Rigid barrier such as extruded polystyrene (XPS).
- Staples.
- Mechanical fasteners.
- Caulk.
- Cellulose or fiberglass loose insulation.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE

METHOD 1:



1. Verify all air sealing and prep work is complete.



2. Attach rigid barrier to cover entire cavity.



3. Seal seams between sheets of rigid material to prevent air movement and insulation leakage.



4. Cut an access hole into each cavity of the floor, large enough for fill tube.



5. Use appropriate fill tube.



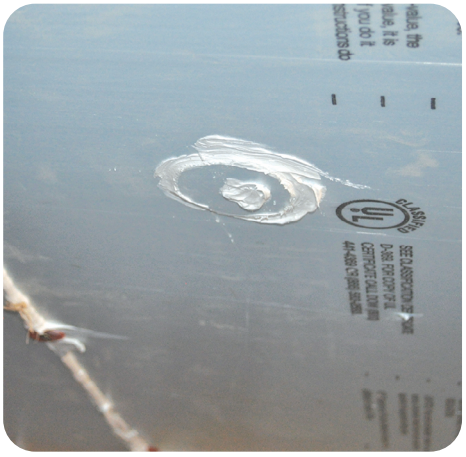
6. Fill cavity completely to density required.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE



7. Plug access hole either with original material cut out or appropriate replacement.



8. Seal around plug to keep it secure and airtight.

NOTES

METHOD 2:



1. For work orders that require netting, secure a smooth layer of netting across the bottom of floor joists.



2. Install using mechanical fasteners spaced according to manufacturer specifications.



3. Cover the entire cavity to ensure continuous insulation coverage and prevent insulation from blowing out the ends.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

14-2 INSULATE A SUBFLOOR WITH BLOWN INSULATION ABOVE UNCONDITIONED SPACE



4. Cut access hole for fill tube.



5. Loose fill netting to required density.



6. Ensure insulation coverage is even and continuous throughout floor cavities.

NOTES

REMINDER

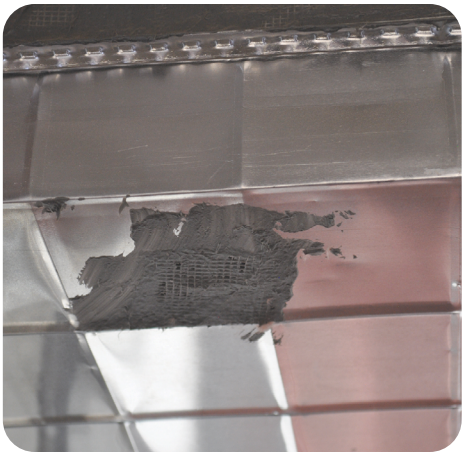
Post insulation certificate at the electrical panel (See appendix A-5).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

15-1 INSULATE A MANUFACTURED HOME BELLY

Aligns with SWS 4.0302.9, 4.0302.1, 3.0102.5, 3.0102.6, 3.0102.7

BEFORE YOU BEGIN



CHECKLIST

- ✓ Air and duct sealing complete.
- ✓ Electrical/plumbing issues fixed.
- ✓ Belly board repaired/replaced.

TOOLS

- Measuring tape.
- Utility knife.
- Drill.
- Insulation machine.
- Pressure gauge.
- Saw.
- Clinch stapler.

MATERIALS

- Belly wrap.
- Belly board.
- Caulk.
- Mechanical fasteners.
- Mastic.
- Spray foam.
- Extruded polystyrene (XPS).
- Furring strips.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

15-1 INSULATE A MANUFACTURED HOME BELLY



1. Remove old insulation and make repairs as needed.



2. Attach new belly wrap.



3. Seal seams of belly wrap.

NOTES



4. Cut access holes to ensure entire cavity will receive continuous and consistent insulation.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

15-1 INSULATE A MANUFACTURED HOME BELLY



5. Fill entire belly cavity to prescribed R-value.



6. Apply waterproof, permanent adhesive to patch for belly wrap, with patch sized at least 3 " larger than hole in barrier.



7. Attach patches using outward clinch staples spaced no more than 2" apart.

REMINDER

Post insulation certificate at the electrical panel (See appendix A-5).

16-1 INSTALL A CRAWLSPACE VAPOR RETARDER

Aligns with SWS 2.0202.1, 2.0202.2, 2.0202.3, 3.0104.1



BEFORE

✗ Moisture and resultant mold issues in crawlspaces can cause extensive damage to floor assemblies and foundations.



AFTER

✓ A well-installed vapor retarder helps to minimize ground moisture vapor and soil gas, such as radon.

TOOLS

- Utility knife.
- Measuring tape.
- Caulk gun.

MATERIALS

- 6-mil plastic sheeting.
- Durable waterproof.
- Construction tape.
- Furring strips.
- Mechanical fasteners.
- Ballast.
- Durable, compatible, sealant.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

16-1 INSTALL A CRAWLSPACE VAPOR RETARDER



1. Clear out storage and debris.



2. Select appropriate materials.



3. Spread out plastic as flat as possible.



4. Extend plastic a minimum of 6 " up walls, piers and columns when it's a conditioned unvented crawlspace.

REMINDER

Plastic sheeting needs to be a minimum of 6-mil.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

16-1 INSTALL A CRAWLSPACE VAPOR RETARDER



5. Use a minimum 12 " reverse shingle overlap and tape seams.



6. Plastic needs to be fastened in an airtight, durable way when it's a conditioned unvented crawlspace.



7. Use ballast to hold down vapor retarder.

8. Install a durable, easily seen sign, sized a minimum of 8.5"x 11" at each access point to the space.

- **DO NOT STORE HAZARDOUS OR FLAMMABLE MATERIALS IN CRAWL-SPACE**
- **AVOID DAMAGING GROUND MOISTURE BARRIER, AIR BARRIER, INSULATION, AND/OR MECHANICAL COMPONENTS**
- **IMMEDIATE REPAIRS ARE NECESSARY IN THE CASE OF DAMAGE**

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

16-2 REPAIR AN EXISTING CRAWLSPACE VAPOR RETARDER

Aligns with SWS 2.0202.1, 2.0202.2, 2.0202.3, 3.0104.1



BEFORE

✗ Improperly installed and damaged vapor retarders do not prevent moisture and mold issues in crawlspace.



AFTER

✓ A well-installed vapor retarder helps minimize ground moisture vapor and soil gas, such as radon.

TOOLS

- Utility knife.
- Measuring tape.
- Caulk gun.

MATERIALS

- 6-mil plastic sheeting.
- Durable adhesive tape.
- Furring strips.
- Mechanical fasteners.
- Ballast.
- Sealant.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

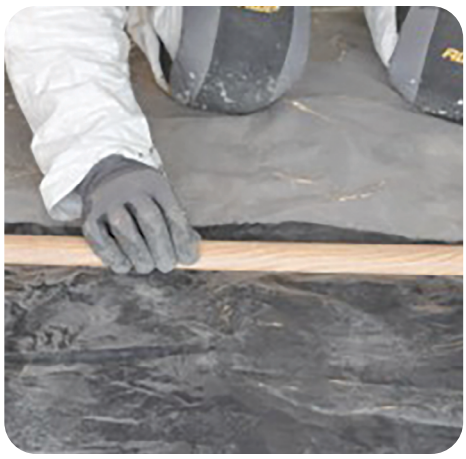
16-2 REPAIR AN EXISTING CRAWLSPACE VAPOR RETARDER



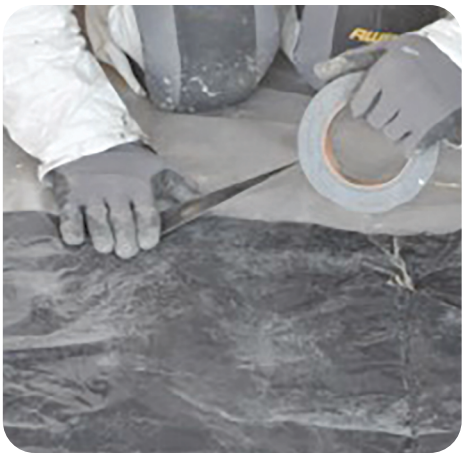
1. When repairing along the ground, ensure seams overlap uphill in a reverse shingle pattern.



2. Overlap seams by at least 12 ".



3. Spread out plastic as flat as possible.



4. Plastic needs to be fastened in an airtight, durable way when it's a conditioned unvented crawlspace.



5. Ensure plastic extends a minimum of 6 " up walls, piers and columns and is securely attached when it's a conditioned unvented crawlspace.

REMINDER

A durable sign must be installed at each access point (See 16-1).

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

17-1 VENT A CLOTHES DRYER

Aligns with SWS 6.0202.1, 6.0101.1, 6.0101.2



BEFORE

✗ Dryer vents with long bumpy runs create a fire hazard.



AFTER

✓ When properly vented, dryers run more efficiently, are safer, and last longer.

TOOLS

- Metal snips or grinder.
- Flathead screwdriver.
- Utility knife.

MATERIALS

- 28 - gauge rigid or semi-rigid metal ducting (UL 2158A approved).
- Worm-drive clamps.
- Backdraft damper.
- Duct insulation.
- Foil tape (181B or 181B-M).

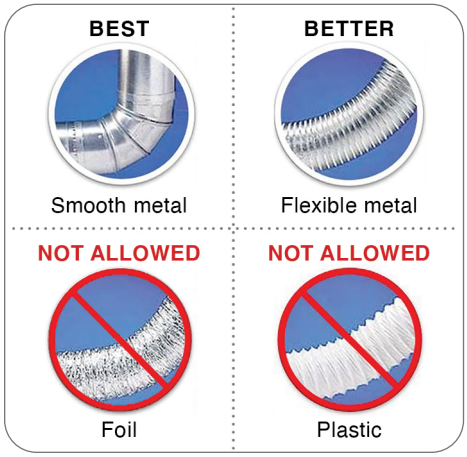
PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

17-1 VENT A CLOTHES DRYER







1. Keep duct run as short as possible to prevent backup of lint.

2. Duct material is metal rigid or semi-rigid. Transition ducts must be labeled UL 2158A, no more than 8' in length, without any joints, and shall not extend beyond the room in which the appliance is located.

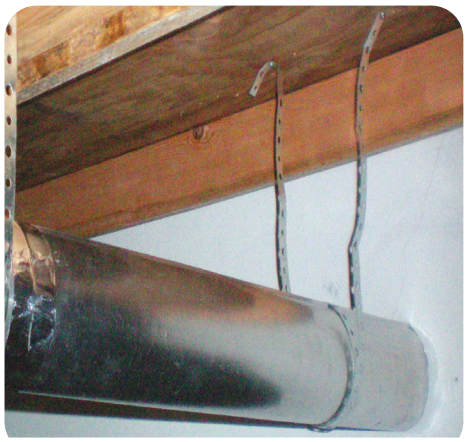
3. Correct fasteners are used (no screws penetrating duct). Support flexible ducts every 4' or less using a minimum of 1-1/2" wide material. Support rigid metal ducts every 10' or less using 1/2" or wider material.

TECH TIP

When calculating dryer duct length, add 5 ' for each 90 degree bend and 2 1/2 ' for each 45 degree bend.

IMPORTANT

Ensure foil tape has the appropriate UL rating (181B or 181B-M).



4. Duct terminates to outside, at a downward slope when possible.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

17-1 VENT A CLOTHES DRYER



5. Termination has backdraft damper and must **not** contain a pest screen.



6. Ducting that runs through unconditioned space will be insulated to R-8.



7. If duct run must exceed 35', install exhaust duct power ventilator.

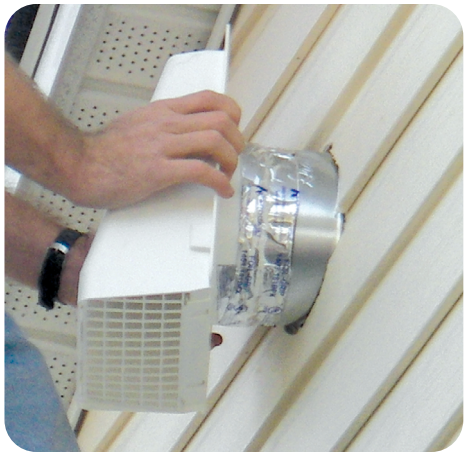
NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

18-1 INSTALL EXHAUST FAN FLEX DUCT

Aligns with SWS 6.0101.1, 6.0101.2, 6.0201.1





BEFORE

✗ Exhausting moisture from fans into the attic or crawlspace can cause mold and rot in building materials.

AFTER

✓ Fans must exhaust to the exterior of the home.

TOOLS

- Measuring tape.
- Utility knife.
- Zip tie tensioner.
- Drill.

MATERIALS

- Flex ducting with R-8 insulation (unless ducting will be buried in insulation).
- Zip ties.
- Support strapping.
- Mechanical fasteners.

PPE



** If going in attic.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

18-1 INSTALL EXHAUST FAN FLEX DUCT







1. Ensure proper connection of duct to fan.
2. Ensure flex ducting runs smoothly with no kinks or U-turns.
3. Create the shortest run possible to an exterior termination and provide adequate support as needed without compressing duct.

REMINDER

Select flexible ducts that are UL 181 listed or Air Diffusion Council approved.

Install all fans per manufacturer specifications.

Ducting that runs through unconditioned space will be insulated to R-8.

18-2 INSTALL A RIGID DUCT EXHAUST VENT

Aligns with SWS 6.0101.1, 6.0101.2, 6.0201.1, 6.0201.2



BEFORE

✗ Bathrooms must be ventilated to control moisture and vapor.

✗ If health and safety concerns exist in the kitchen, range hoods must be ventilated.

TOOLS

- Measuring tape.
- Hole saw.
- Drill.
- Caulk gun.

MATERIALS

- Mastic.
- Brush.
- Foil tape (UL 181B or 181B-M).
- Duct insulation.
- 28 - gauge ducting.
- Vent termination.
- Caulk.

AFTER

KITCHEN CHECKLIST

✓ Located within 5 ' of primary cooking surface.

✓ At least 100 cfm but not more than 3 sones.

✓ Efficacy of 2.8 cfm/watt or more.

✓ When continuous the fan should be 1 sone or less.

BATHROOM CHECKLIST

✓ Located in center of room.

✓ At least 50 cfm but not more than 2 sones.

✓ Efficacy of 4 cfm/watt or more.

✓ When continuous the fan should be 1 sone or less.

PPE



** If going in attic. **Weather dependent if going in attic.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

18-2 INSTALL A RIGID DUCT EXHAUST VENT



1. Fasten rigid duct using three equally spaced screws.



2. Keep duct run as short as possible with few turns, and run to exterior, either via roof or sidewall.



3. Seal all joints with mesh and mastic or foil tape (UL 181B or 181B-M).



4. Completely seal joints.

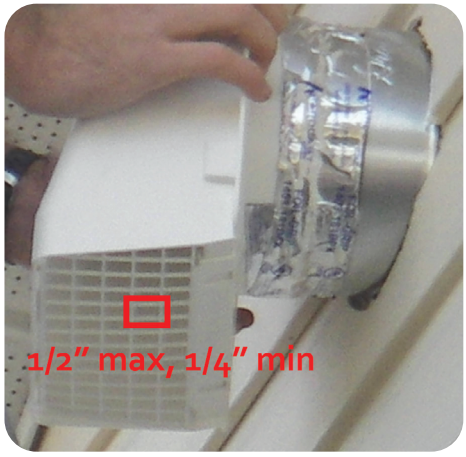
REMINDER

- Install all fans per manufacturer specifications.
- If fans are being installed for ASHRAE, follow the ASHRAE 62.2 2016 Standard.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

18-2 INSTALL A RIGID DUCT EXHAUST VENT







5. Locate exterior vent based on duct run and size hole less than 1/2 " larger than duct.

6. Choose appropriate exterior termination to match size of duct while minimizing water intrusion and pest infestation. Seal around exterior termination as needed.

7. Ducting that runs through unconditioned space will be insulated to R-8.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-1 SEAL DUCTS WITH MASTIC

Aligns with SWS 5.0106.1, 6.0101.2, 6.0101.3, 5.0105.1, 5.0105.2, 5.0105.3



CHECKLIST

✓ Ensure ducts are properly connected and supported.

TOOLS

- Drill.
- Zip tie tensioner.
- Caulk gun.

MATERIALS

- Mastic.
- Fiberglass mesh tape.
- Chip brush.
- Mechanical fasteners.
- 26 - gauge metal sheeting.
- Duct or electrical tape.
- Flexible caulking.
- Butyl tape.

TECH TIP

Mastic alone can be used for gaps <1/8 ", when gap is located more than 10 " from air handler and static pressure is less than 1 iwc.

Rolled mastic sealant can be used in place of fiberglass mesh tape and mastic.

PPE

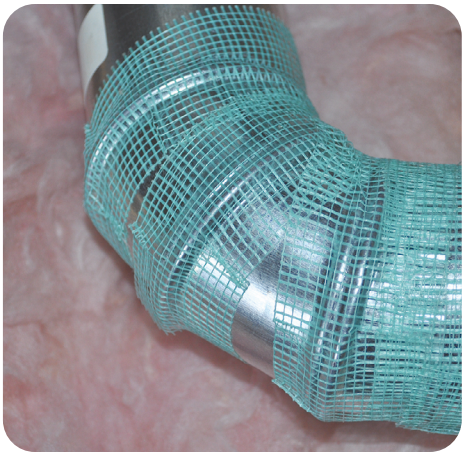


**Location dependent. **Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-1 SEAL DUCTS WITH MASTIC

METHOD A – FOR SMALL GAPS (LESS THAN 1/4 INCH) INCLUDING ALL JOINTS, SEAMS, AND CRACKS IN DUCT SYSTEM



A-1. Apply fiberglass mesh tape over all gaps, seams, joints, etc.



A-2. Apply mastic over all mesh tape and all gaps, seams, joints, etc.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-1 SEAL DUCTS WITH MASTIC

METHOD B – FOR MEDIUM GAPS (1/4-3/4 INCH) SUCH AS MINOR HOLES AND PENETRATIONS IN DUCT SYSTEM



B-1. Small holes and penetrations require an additional step.



B-2. Apply tape as a backer to hold mastic.



B-3. Apply mastic over the tape.



B-4. Push fiberglass mesh into the mastic.



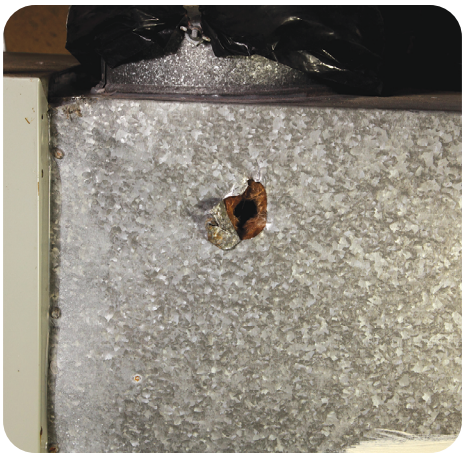
B-5. Apply additional mastic over mesh and tape, extending at least 1 " past edges of tape in all directions.

NOTES

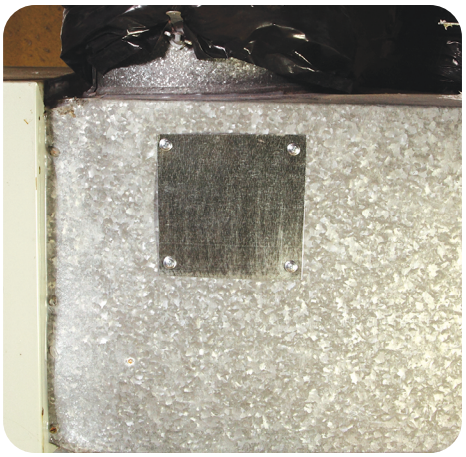
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-1 SEAL DUCTS WITH MASTIC

METHOD C – FOR LARGER GAPS OR HOLES (OVER 3/4 INCH)



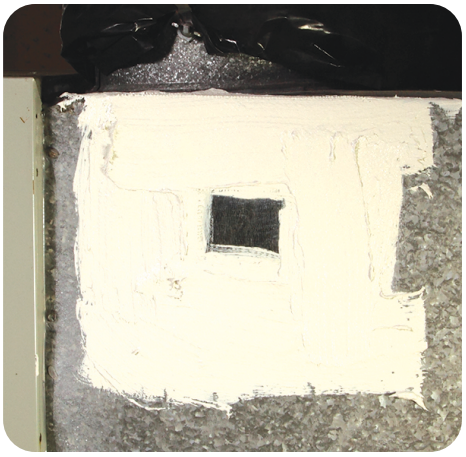
C-1. Larger holes require a different process.



C-2. Cut patch that will extend over entire gap or hole and affix with mechanical fasteners.



C-3. Apply mastic over edges and fasteners of patch and push fiberglass mesh into it.



C-4. Apply additional mastic over mesh, extending at least 1 " past tape and seam in all directions.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-1 SEAL DUCTS WITH MASTIC

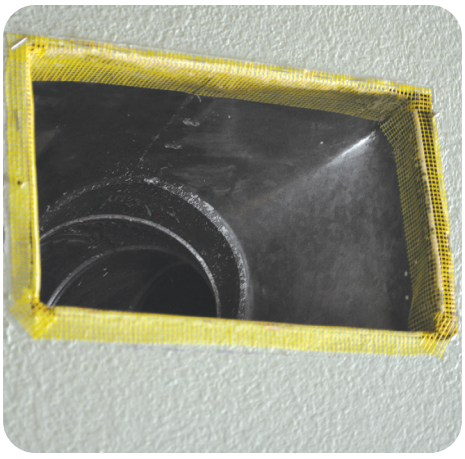
METHOD D – FOR CONNECTIONS BETWEEN DUCT BOOT AND SURFACE



D-1. Often, holes for duct boots are cut too large and leave gaps around the boot as a path for air leakage.



D-2. Clean the area around the duct boot to allow for better adhesion of fiberglass mesh tape.



D-3. Apply fiberglass mesh tape bridging from duct boot interior to surface, taking care not to extend past what will be covered by register.



D-4. Apply mastic over mesh tape and allow to dry completely before reinstalling register.

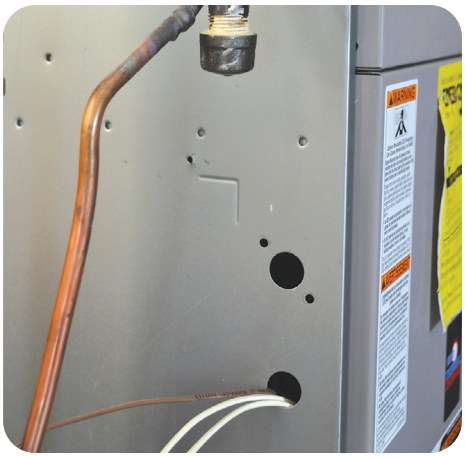
NOTES

19-1 SEAL DUCTS WITH MASTIC

METHOD E – AT THE AIR HANDLER



E-1. Ensure filter slot cover is removable so occupant can change filter as needed, but does not allow for bypass air around air filter.



E-2. Seal unnecessary holes in air handler cabinet with butyl tape.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-2 MOBILE HOME DUCT SEALING

Aligns with SWS 5.0106.1, 6.0101.2, 6.0101.3, 5.0105.1, 5.0105.2, 5.0105.3



CHECKLIST

- ✓ Ensure the underside of the air handler cabinet is airtight.
- ✓ Ensure the trunk line ends are airtight.

TECH TIP

Mastic alone can be used for gaps <1/8 ", when gap is located more than 10 " from air handler and static pressure is less than 1 iwc.

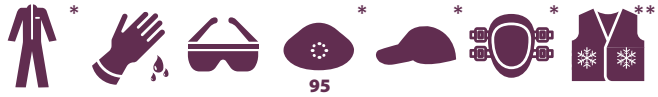
TOOLS

- Drill.
- Caulk gun.
- Utility knife.

TOOLS

- Mastic.
- Fiberglass mesh tape.
- Chip brush.
- Mechanical fasteners.
- 26 - gauge metal sheeting.
- Duct or electrical tape.
- Flexible caulking.
- Butyl tape.

PPE



** Location dependent. **Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

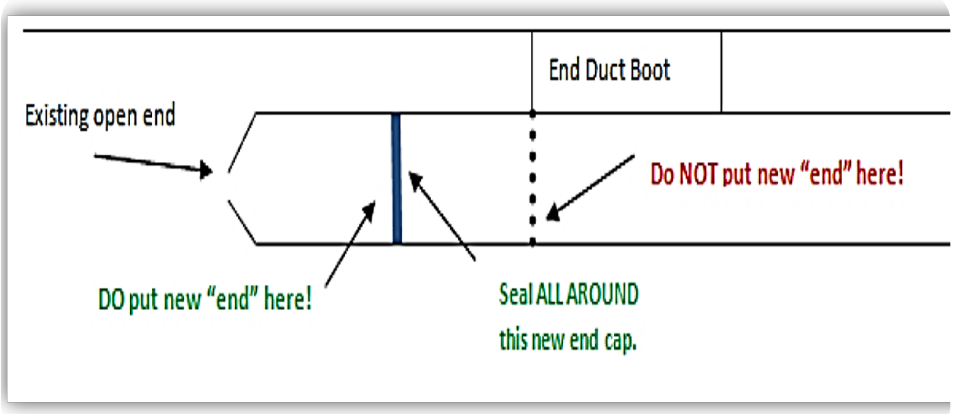
19-2 MOBILE HOME DUCT SEALING

SEALING TRUNK ENDS





1. Trunk ends will always be leaky. These can be easily made airtight by inserting a rigid material such as sheet metal, cut to fit inside the duct and cap the end 6 to 12 " in from the boot where it is inserted.



2. Be careful not to install the newly cut duct end right at the boot. This will cause pressure imbalances throughout the mobile home. Once in place seal all around the new end cap with mastic. Use fiberglass mesh tape for any larger gaps, then cover with mastic.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

19-2 MOBILE HOME DUCT SEALING

SEALING AT AIR HANDLER BASE



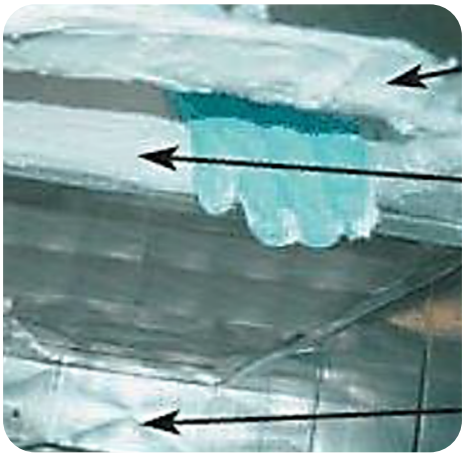
1. Below the air handler is leaky. Even when tape is present, it is peeling off and no longer sealed.



2. One way to access this area is through the air handler by removing its lower door.



3. Another way to access this area is to cut into the belly and cut an access in the trunkline below the furnace.



4. Seal all around the connection using mastic. Use fiberglass mesh for any large gaps, then cover with mastic.



5. Seal any access point you made on the underside by securing sheet metal with screws and sealing with mastic.

REMINDER

Reinstall the air handler door if it was removed for accessing the trunkline.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-1 INSULATE RIGID DUCTS

Aligns with SWS 5.0107.1, 5.0105.2, 6.0202.1





BEFORE YOU BEGIN

VERIFY DUCTS ARE:

- ✓ Connected properly.
- ✓ Supported properly.
- ✓ Air-sealed properly.

AFTER

Well-supported and uniformly-insulated ducts perform at higher efficiency.

TOOLS

- Measuring tape.
- Utility knife.

MATERIALS

- Duct insulation (min R-8) with exterior vapor retarder.
- UL-181 tape.
- Twine.
- Zip ties.

PPE



** Location dependent. **Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-1 INSULATE RIGID DUCTS



1. Layer insulation around duct, fitting between duct and construction members as necessary and able.



2. Tape joints to secure insulation in place.



3. Ensure insulation is not compressed.



4. Tape around circumference of duct at regular intervals.



5. Twine or zip ties can also be used to offer additional support for insulation – but workers must ensure insulation is not compressed.

REMINDER

Support metal ducts with 1/2 ” wide or greater 18 - gauge metal straps, 12- gauge galvanized wire, or metal rods every 10’ or less.

Ducts must never contact the ground.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-2 INSULATE FLEX DUCTS

Aligns with SWS 5.0107.1, 5.0105.2





BEFORE YOU BEGIN

VERIFY DUCTS ARE:

- ✓ Connected properly.
- ✓ Supported properly.
- ✓ Air-sealed properly.

AFTER

Ducts in unconditioned spaces require a minimum R-8 insulation. If exposed to the exterior, R-12.

TOOLS

- Measuring tape.
- Utility knife.
- Zip tie tensioner.

MATERIALS

- Duct insulation (min R-8) with exterior vapor retarder.
- UL-181 tape.
- Twine.
- Zip ties.

PPE



** Location dependent. **Weather dependent.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-2 INSULATE FLEX DUCTS



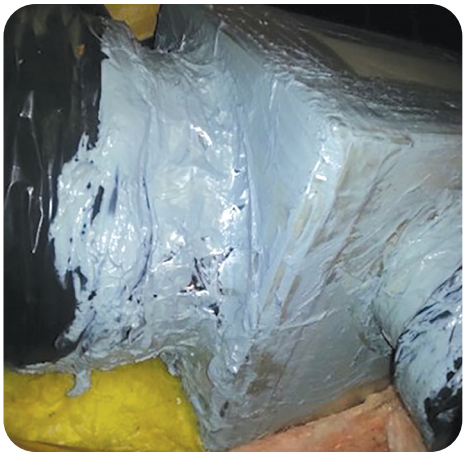
1. Secure the liner inside the flexible duct to the hard connections with zip tie and tensioner tool.



2. Pull insulation over hard connections.



3. Secure vapor retarder layer at boots.



4. Seal new joints.

REMINDER

Support flexible ducts, duct board ducts, and plenums with 1-1/2" wide or greater material, installed every 4' or less, without crimping or pinching the ductwork or reducing the interior dimensions.

Ducts must never contact the ground.

20-3 INSULATE SUPPLY BOOTS

Aligns with SWS 5.0107.1, 5.0107.2



✗ Exposed duct boots are a prime location for energy loss.



BEFORE YOU BEGIN

Ensure ducts are:

- ✓ Properly connected.
- ✓ Properly supported.
- ✓ Properly air-sealed.

TOOLS

- Measuring tape.
- Utility knife.
- Zip tie tensioner .

MATERIALS

- R-8 minimum flex duct insulation.
- Duct insulation with vapor retarder.
- Zip ties.
- Twine.
- Spray adhesive.
- Mastic.
- UL 181 tape.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-3 INSULATE SUPPLY BOOTS





1. Insulate all exposed metal of the boot.

2. Ensure a complete vapor barrier by sealing all seams with mastic.

REMINDER

- R-8 minimum for ducts in unconditioned spaces.
- R-12 minimum for ducts exposed to outside elements.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-4 INSULATE PLENUM

Aligns with SWS 5.0107.1





BEFORE

✗ Return and supply plenums left uninsulated with contact to unconditioned spaces allow for energy loss.

AFTER

FINAL CHECKLIST

✓ Ducts are connected properly.

✓ Ducts are supported properly.

✓ Ducts are air-sealed properly.

TOOLS

- Measuring tape.
- Utility knife.

MATERIALS

- R-8 minimum duct insulation.
- Spray adhesive.
- Twine.
- Mechanical fasteners.
- Extruded polystyrene.
- Gypsum board.
- Mastic.
- UL-181 tape.
- Butyl tape.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-4 INSULATE PLENUM



1. Cover any unnecessary holes in the air handler cabinet.



2. Verify return cavities within the building envelope are sealed from unconditioned spaces using a suitable material such as gypsum board.



3. Patch holes in ducts and plenum with appropriate materials (see 19-1 Seal Ducts with Mastic).



4. Prepare plenum by removing any residue from old insulation.

IMPORTANT

Expanded Polystyrene (EPS) is not appropriate for use in high-temperature areas, particularly inside framed return platforms.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-4 INSULATE PLENUM



5. Measure insulation to take maximum advantage of large sheets of duct insulation.



6. Cut to size for area to be covered. Insulate all exposed metal of the plenum.

NOTES



7. To ensure a complete vapor barrier, trim insulation from vapor barrier to create overlap flap for seams or tape seams with UL-181 tape.



8. Ensure clean surface for adhesion at overlap seam.



9. Spray adhesive over area where piece will be installed.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

20-4 INSULATE PLENUM



10. Ensure smooth and unrippled adhesion of insulation to metal of plenum.



11. Spray adhesive along vapor retarder at seam to seal closed.



12. Ensure the overlapping flap securely adheres to the lower layer to maintain complete vapor barrier, or tape seams with UL-181 tape.



13. Support insulation to prevent movement over time, securing in place without puncturing vapor retarder.

REMINDER

Secure reflective insulation to duct in compliance with manufacturer specifications including required air spaces.

Post insulation certificate at the electrical panel (See appendix A-5).

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-1 WINDOW INSTALLATION

Aligns with SWS 3.0201.9





BEFORE

✗ Single pane aluminum-frame windows offer little to no thermal break from outdoors.

AFTER

FINAL CHECKLIST

✓ Window opens and closes properly.

✓ All exterior edges are air sealed.

✓ Water flows away from window.

IMPORTANT

Check file for age of house and complete any required lead testing before work begins.

PPE



TOOLS

- Measuring tape.
- Utility knife.
- Drill.
- Spray foam gun.
- Vaccuum.

MATERIALS

- Plastic sheeting.
- Shims.
- Flashing tape.
- Mechanical fasteners.
- Backer rod.
- Spray foam.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-1 WINDOW INSTALLATION



1. Measure window to be replaced.



2. Remove existing window.



3. Clean up sash or jam and repair any issues.



4. Install flashing per the manufacturer specifications.



5. Dry fit window.



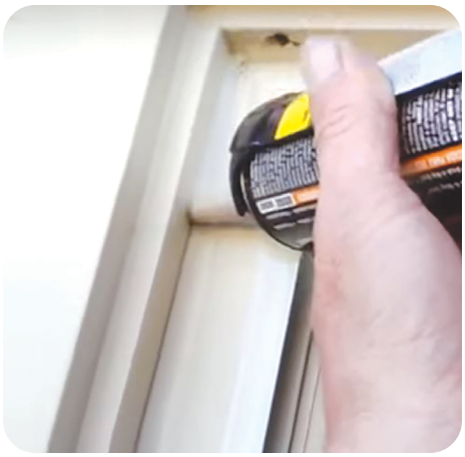
6. Level the window using shims and secure with mechanical fasteners.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-1 WINDOW INSTALLATION



7. Ensure window is operational.



8. Caulk all exterior edges.



9. Insulate and seal rough opening with backer rod and/or spray foam.



10. Replace trim.

REMINDER

Select windows that meet the SHGC, U-value, and air leakage requirements of the work order.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-2 DOOR INSTALLATION

Aligns with SWS 3.0202.2





BEFORE

✗ In rare cases, doors are too damaged to be retrofitted and must be replaced.

AFTER

FINAL CHECKLIST

✓ Weatherstrip and door bottom installed.

✓ Door opens and closes properly.

✓ All exterior trim is caulked.

✓ Water will flow away from the door.

IMPORTANT

Check file for age of house and complete any required lead testing before work begins.

PPE



TOOLS

- Measuring tape.
- Utility knife.
- Saw.
- Drill.
- Level.
- Caulk gun.
- Spray foam gun.
- Jamb saw.

MATERIALS

- Lumber.
- Shims.
- Mechanical fasteners.
- Adhesive.
- Spray foam.
- Caulk.
- Insulation.
- Weatherstrip.
- Door bottom.
- Lock set.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-2 DOOR INSTALLATION



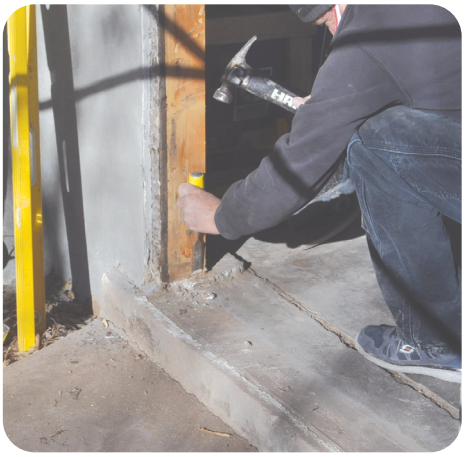
1. Remove old door and clear away debris.



2. Measure opening and ensure the door on location is the proper size.



3. Prepare opening by ensuring jacks are plumb and threshold is level.



4. Frame in and adjust opening as necessary to accommodate new door.



5. Attach flashing, if necessary, to protect any new materials from water intrusion.



6. Using shims, position door in frame, adjusting for level and plumb, and attach securely.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

21-2 DOOR INSTALLATION



7. Ensure door is fully operational and lock set is aligned.



8. Insulate gaps between door jamb and frame.



9. Seal rough opening, to prevent air and water intrusion.



10. Replace trim.



11. Seal along threshold, ensuring water will flow away from door.

REMINDER

Install all doors per the manufacturer's specifications.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

22-1 WINDOW GLASS REPLACEMENT

Aligns with SWS 3.0201.1, 3.0201.4





BEFORE

✗ Broken, cracked or missing glass breaks the pressure and thermal boundary.

AFTER

✓ Newly installed glass is sealed to prevent air and water infiltration.

TOOLS

- Heavy work gloves.
- Glass cutter.
- Scraping tool.

MATERIALS

- Cleaning solution.
- New window pane.
- Silicone caulk.
- Window glazing.
- Tape.

IMPORTANT

Check file for age of house and complete any required lead testing before work begins.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

22-1 WINDOW GLASS REPLACEMENT



1. Remove all broken glass.



2. Clean all debris, caulk, etc., from sash.



3. Measure rough opening for pane, size pane 1/8-3/16 " less than RO.



4. Run interior bead of caulk.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

22-1 WINDOW GLASS REPLACEMENT



5. Install new glass, using tempered where code requires, that meets or exceeds previous glazing.



6. Hold new pane with tape or stops.



7. Caulk all edges.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

23-1 INSULATE AN ELECTRIC DOMESTIC WATER HEATER

Aligns with SWS 7.0301.2





BEFORE YOU BEGIN

Check data plate on water heater to find existing insulation level, if any, and verify additional insulation is not prohibited.

AFTER

✓ A properly insulated water heater safely reduces standby losses.

TOOLS

- Utility knife.

MATERIALS

- Water heater insulation. blanket.
- Foil tape.
- Tie strap.
- Wire.
- Twine.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

23-1 INSULATE AN ELECTRIC DOMESTIC WATER HEATER



1. Insulate tank with minimum R-10 or better.



2. Ensure a continuous vapor barrier with no gaps.



3. Do not obstruct temperature and pressure relief valve (T&P).



4. Seal all seams and edges airtight using compatible and durable tape.



5. Cut flaps at access plates, tape them shut and then label from the exterior.



6. Secure seams with tie strap, wire or twine and minimal compression.

NOTES

23-2 INSULATE A GAS DOMESTIC WATER HEATER

Aligns with SWS 7.0301.2, 7.0302.2





BEFORE YOU BEGIN

Check data plate on water heater to find existing insulation level, if any, and verify additional insulation is not prohibited.

AFTER

✓ A properly insulated water heater safely reduces standby losses.

TOOLS

- Utility knife.

MATERIALS

- Water heater insulation blanket.
- Foil tape.
- Tie strap.
- Wire.
- Twine.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

23-2 INSULATE A GAS DOMESTIC WATER HEATER



1. Insulate tank with minimum R-10 or better.



2. Ensure a continuous vapor barrier without gaps.



3. Cut insulation to allow 6 ″ space to draft diverter and flue pipe.



4. Do not obstruct burner access plate or combustion air intake.

IMPORTANT

Maintain a minimum clearance of 6″ or the distance specified by the manufacturer between combustible tank insulation and fuel-fired water heater draft hood and/or single wall metal vent materials.

Do not wrap the top of fuel-fired water heaters or cover combustion air intakes.

23-2 INSULATE A GAS DOMESTIC WATER HEATER



5. Do not obstruct temperature and pressure relief valve (T&P).



6. Tape all seams and edges airtight.



7. Cut flaps at access plates, tape them shut and then label from the exterior.



8. Secure seams with tie strap, wire or twine and minimal compression.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES

Aligns with SWS 7.0301.1



Insulate pipes to a minimum of R-3 for at least 6 ' from DHW on hot and cold lines.



Insulation should be continuous without gaps.

TOOLS

- Utility knife.
- Measuring tape.

MATERIALS

- Pipe insulation.
- Tape or tie straps.

NOTES

PPE

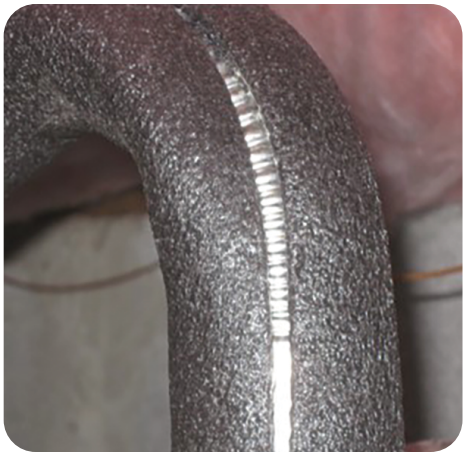


Tools and materials listed are only recommendations and may not include everything needed to complete the job.

23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES



Keep insulation back at least 6 " from draft diverter and single wall pipe.



Do not rely on manufactured adhesive seam seal to hold closed.



Secure using compatible and durable tape.



When path is partially obstructed or curved, shape insulation to the location to eliminate gaps.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

24-1 INSTALL A LOW-FLOW SHOWERHEAD

Aligns with SWS 7.0201.1





BEFORE

✗ Higher flow showerheads waste water and cause water heaters to run more than necessary.

AFTER

✓ Low-flow showerheads must be 2.5 gallon per minute (gpm) or less flow rate, to reduce heating load and encourage lower water use.

TOOLS

- Adjustable wrench.
- Pipe wrench.
- Channel locks.
- Buffer material.
- Rag.
- Toothbrush/wire brush.

MATERIALS

- Thread tape.
- New showerhead.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

24-1 INSTALL A LOW-FLOW SHOWERHEAD



1. Carefully remove old showerhead with adjustable wrench, taking care not to loosen shower arm.



2. If old showerhead does not have flat sides at connection, wrap with buffer material, such as a piece of rubber.



3. Use pipe wrench or channel locks to loosen connection at shower arm.



4. Clean threads of shower arm well to remove old residue.



5. Wrap new thread tape around threads.



6. Install new showerhead according to occupant needs, such as hand-held, shutoff or swivel.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

24-1 INSTALL A LOW-FLOW SHOWERHEAD



7. Ensure connections will not leak while preventing damage by using buffer material.



8. Use thread tape at all connections.



9. Verify proper water flow and that there are no leaks.

REMINDER

Provide occupants/owners with user's manual, warranty information, installation instructions and installer contact information.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

24-2 INSTALL A LOW-FLOW FAUCET AERATOR

Aligns with SWS 7.0201.1



BEFORE

✗ Faucets without aerators produce excess flow and old aerators can impinge flow or cause leakage.



AFTER

✓ Low-flow faucet aerators limit flow to 2.2 gpm or less and reduce heating load by encouraging lower water use.

TOOLS

- Adjustable wrench/ aerator wrenches.
- Soft rag.

MATERIALS

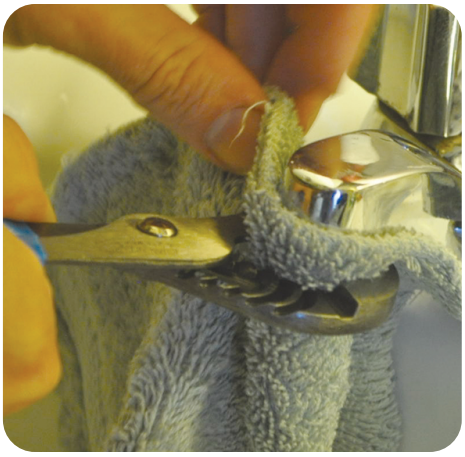
- Thread tape.
- WaterSense aerator.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

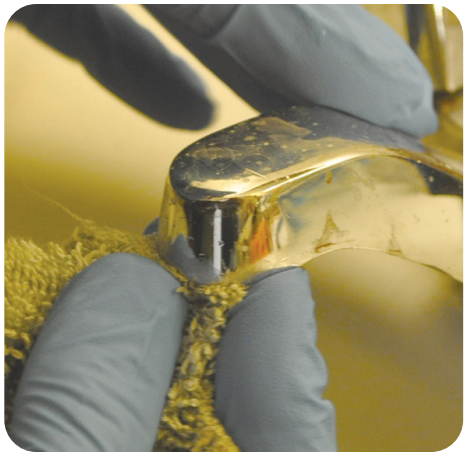
24-2 INSTALL A LOW-FLOW FAUCET AERATOR



1. Using adjustable wrench or aerator wrench, gently remove old aerator.



2. Once loose, continue removal by hand.



3. Clean threads of the faucet with a soft rag to remove any debris.



4. Verify size and type of aerator will work with faucet.



5. Wrap thread tape around new aerator if male, or faucet threads if it takes a female aerator.



6. Carefully install new aerator, ensuring any necessary rubber washers are in place and taking care not to cross-thread.

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

24-2 INSTALL A LOW-FLOW FAUCET AERATOR



7. Do not overtighten aerator.



8. Run water through new aerator to verify it is not cross-threaded and no water is leaking around sides.



9. Remove old aerator from property and permanently dispose of it.

TECH TIP

For kitchen sinks, 1.0-1.5 gpm save water without affecting performance. For lavatory sinks, as low as 0.5 gpm is adequate.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

25-1 INSTALL ROOF VENT

Aligns with SWS 6.0101.2, 6.0201.1, 6.0201.2, 4.0188.2



BEFORE

✗ Kitchens, bathrooms and attics all have requirements for ventilation to the exterior, as well as dryer and combustion exhaust venting.



AFTER

✓ A properly installed vent preserves the integrity of the roof.

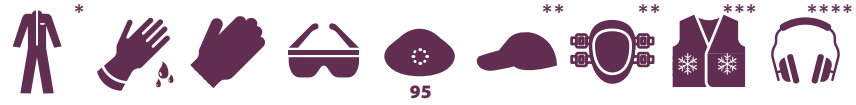
TOOLS

- Measuring tape.
- Drill.
- Hole saw.
- Caulk gun.
- Utility knife.
- Mastic brush.

MATERIALS

- Vent with collar.
- Caulk.
- Mechanical fasteners.
- Joint tape.
- Mastic.

PPE



** If going in attic. **Location dependent. ***Weather dependent. ****If using power tools.*

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

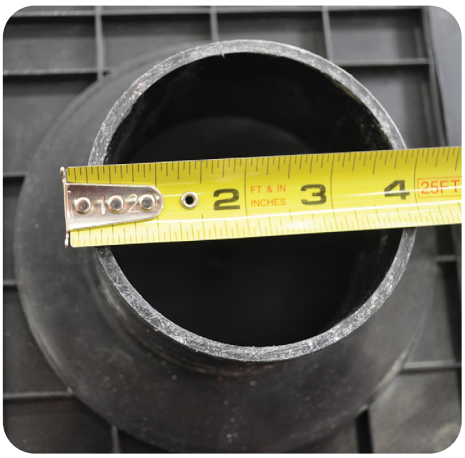
25-1 INSTALL ROOF VENT





1. Determine the appropriate vent dependent on its use – attic ventilation, kitchen hood, bath fan, dryer exhaust (these should ideally be lower), or combustion exhaust.

2. Locate ideal hole location from attic side of roof deck and drill center hole.





3. Mark out size and location of hole on roof deck, verifying size of termination collar.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

25-1 INSTALL ROOF VENT







4. From roof side, cut hole slightly larger than termination collar. If shingle roof, cut just below one layer of shingles to preserve overlap.

5. Run sealant around perimeter of vent and tuck under any surrounding uphill shingles. Seal uphill shingles over vent.







6. Collar should extend down through roof into attic.

7. Slide vent ducting to collar, sized to match the duct diameter, and attach with mechanical fasteners.

8. Seal duct joints with mesh and mastic to complete vent installation. Insulate as required.

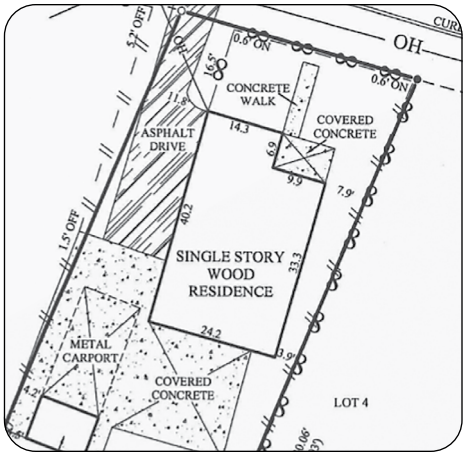
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

25-2 SELECTING LOCATION FOR EXTERIOR TERMINATION

Aligns with SWS 6.0101.2

CHECKLIST

✓ Ensure all exhaust terminations vent outdoors, not into attics or crawlspaces, and:



✓ At least 3 ' from the property line.



✓ At least 3 ' from all operable openings.



✓ At least 10 ' from a mechanical intake.



✓ When near soffits, ensure no open soffit venting is within 6 ' on either side.

IMPORTANT

See these Job Aids for appropriate termination installations:

17-1 Vent a Clothes Dryer

18-1 Install Exhaust Fan Flex Duct (Bath Fan Only)

18-2 Install a Hard-Ducted Exhaust Vent

25-1 Install Roof Vent

26-1 SUMP WELL/PIT COVERS

Aligns with SWS 2.0401.2





BEFORE

✗ Sump pit is open and exposed. Potentially letting radon enter the living space.

AFTER

✓ Airtight, accessible, rigid cover while ensuring proper drainage.

TOOLS

- Drill and bits.
- Caulk gun.
- Utility knife.

MATERIALS

- Sump pump cover.
- Silicone.
- Waterproof tape.
- Screws.

PPE



Tools and materials listed are only recommendations and may not include everything needed to complete the job.

26-1 SUMP WELL/PIT COVERS



1. Select a cover that has a one-way ball valve when appropriate.



2. Clean the area around the sump pump pit where the cover is being attached.



3. Fit the cover around any drainage pipes and flush to the top of the pit.



4. Fasten down lid making sure any sealing gaskets are in place.



5. If any gaps remain, use a suitable silicone and/or waterproof tape to seal.

NOTES

Tools and materials listed are only recommendations and may not include everything needed to complete the job.

A-1 Index of Standard Work Specifications Referenced:

**Note: Inclusion on this list does not imply that every Specification within the cited Detail is addressed in the Field Guide/ Appendices. Job Aids in parentheses ( ) presume referenced SWS has been followed.

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2.0101.1	Hardwired (interconnected) Smoke Alarms	A-2
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2.0202.3	Pier and Skirting Foundations – Ground Cover	16-1, 16-2
2.0401.2	Sump Well/Pit Covers	26-1
3.0101.1	Air Sealing Holes	2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 8-1, 8-2, 13-1, 13-2, 13-3
3.0102.1	Sealing Non-Insulation Contact Recessed Light	3-2
3.0102.2	Sealing High-Temperature Devices	3-1
3.0102.4	Sealing Firewalls	2-4, 13-3
3.0102.5	MH Belly Repair – Soft Bottom Patching	(15-1)
3.0102.6	MH Belly Repair – Soft Bottom Replacement	(15-1)
3.0102.7	MH Belly Repair – Rigid Bottom Patching	(15-1)
3.0102.9	Sealing Dropped Soffits/Bulkheads	2-2
3.0102.11	Sealing Roof/Wall Connections	2-1, 8-1
3.0103.1	Access Doors and Hatches	5-1, 5-2
3.0104.1	Closed Crawlspace Air Sealing	12-1, 13-1, 13-2, (16-1, 16-2)
3.0201.1	Window Air Sealing	22-1
3.0201.4	Glass Replacement	22-1
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3.0202.1	Door Air Sealing	11-1, 11-2
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4.0103.1	Accessible Attic – Batt Installation	4-1
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4.0103.3	Accessible Attic – Batt Insulation over Existing Insulation	4-1
4.0103.4	Accessible Attic – Loose Fill over Existing Insulation	4-1, 6-1
4.0103.5	Accessible Attic – SPF on Attic Floor	4-1
4.0103.6	Accessible Attic – Dense Pack Insulation	4-1, 6-1, 7-1
4.0103.8	Loose Fill to Capacity	4-1
4.0103.9	MH – Blown Insulation via Gable End Access	7-1, 7-2

2020 SWS	Detail Title	Job Aids
4.0103.10	MH – Blown Insulation via Roof Side Lift Access	7-1, 7-3
4.0103.11	MH – Blown Insulation via Roof Top Access	7-1, 7-4, 7-6
4.0103.12	MH – Blown Insulation via Interior Access through the Ceiling	7-1, 7-5
4.0104.1	Knee Wall – Dense Packing	6-3, 8-5
4.0104.2	Knee Wall – Batt Insulation	6-3, 8-3
4.0104.3	Knee Wall – Existing Batt Insulation Repair	6-3, 8-3
4.0104.4	Knee Wall – Rigid Insulation	6-3
4.0188.2	Unconditioned Attic Ventilation	25-1
4.0201.2	Batt Insulation (Accessible Walls)	6-3
4.0201.3	Dense Pack Insulation (Accessible Walls)	6-3
4.0202.1	Dense Pack Insulation (Enclosed Walls)	6-3, 9-1, 9-2
4.0202.3	MH – Fiberglass Batts (Enclosed Walls)	10-1
4.0202.4	MH – Blown Fiberglass (Enclosed Walls)	10-2
4.0202.5	MH – Blown Fiberglass through Penetrations (Enclosed Walls)	10-2
4.0301.1	Batt Insulation in Joisted Cavities (Accessible Floors)	14-1
4.0301.2	Loose Fill with Netting/Fabric in Joisted Cavities	14-2
4.0301.3	Loose Fill in Joisted Cavities with Rigid Barrier	14-2
4.0301.4	Dense Pack in Joisted Cavities with Rigid Barrier	14-2
4.0301.6	Cantilever Floor Joisted Cavities Batt Insulation	14-1
4.0302.1	Batt Insulation with Rigid Barrier (Exposed Floors)	14-1, 15-1
4.0302.2	Loose Fill with Rigid Barrier	14-2
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4.0302.9	MH – Blown Belly Insulation	15-1
4.0401.2	Batt Insulation	12-2
4.0401.3	Rigid Insulation	12-2
4.0402.1	Closed Crawlspace – NonFoam Insulation (Walls)	(12-4)
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2020 SWS	Detail Title	Job Aids
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7.0103.5	Emergency Lighting Replacement	A-3
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7.0103.7	Daylighting	A-3
7.0104.1	Occupancy Sensors	A-3
7.0104.2	StandAlone Timers	A-3
7.0104.3	Motion Control Sensors	A-3
7.0104.4	Outdoor Photo Sensors	A-3
7.0104.5	BiLevel Controls	A-3
7.0201.1	LowFlow Devices	24-1, 24-2
7.0301.1	Pipe Insulation	23-3
7.0301.2	Tank Insulation	23-1, 23-2
Lead RRP	EPA's Lead Renovation, Repair, and Painting Rule	1-1, 1-2
NFPA 72	National Fire Alarm and Signaling Code	A-2
NFPA 720	Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment	A-2

Useful Acronyms in this Guide:

ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers, https://www.ashrae.org

EPS: Expanded Polystyrene – lightweight insulation board composed of foam beads, will absorb water

gpm: Gallons per Minute, measurement of water flow at a fixture

LED: Light-Emitting Diode, increasingly cost-effective and efficient lighting technology

IESNA: Illuminating Engineering Society of North America, https://www.ies.org

NECA: National Electrical Contractors Association, https://www.necanet.org/

NEMA: National Electrical Manufacturers Association, https://www.nema.org/Standards

NFPA: National Fire Protection Association, https://www.nfpa.org

OSB: Oriented Strand Board, wood by-product pressed into sheets, similar to particle board but with larger pieces compressed together with adhesives

SWS: Standard Work Specification, https://sws.nlr.gov

UL: Underwriters Laboratories, https://ul.org

XPS: Extruded Polystyrene – lightweight insulation board characterized by smooth uniform foam appearance, often in pastel colors indicating manufacturer

A-2 Safety Measures

Smoke Alarm Installation

Aligns with 2.0101.1, 2.0101.2, NFPA 72

Smoke alarms, either battery-operated or hardwired (interconnected), will be listed and labeled in accordance with UL 217.

Battery-operated smoke alarms will have sealed, non-replaceable 10-year batteries.

Smoke alarms, either battery-operated or hardwired (interconnected), will be installed in the locations required by authority having jurisdiction.

NFPA 72 states that smoke alarms will be installed:

- Inside each bedroom.
- Outside each sleeping area.
- On every level of the home, including the basement.
    - If a level does not have a bedroom, install in the living room or near the stairway to the upper level, or both locations.
    - In the basement, install on the ceiling at the bottom of the stairs leading to the next level.
- On walls at a height not more than 12 ” away from the ceiling (to the top of the alarm) or on the ceiling.
- At least 10 ’ from any cooking appliance.
- Away from windows, doors, or ducts where drafts might interfere with their operation.
- For pitched ceilings, install alarm within 3 ‘ of the peak, but not in the apex (within 4 “ of the peak).

Install smoke alarms in accordance with the manufacturer’s instructions.

Provide occupants the manufacturer’s written instructions.

Carbon Monoxide (CO) Detection and Warning Equipment

Aligns with 2.0102.1, NFPA 72

Select CO alarms that are listed and labeled in accordance with UL 2034, or approved by the authority having jurisdiction, have a minimum of 10-year manufacturer’s warranty and contain internal, non-replaceable batteries.

Install CO alarms in the locations required by the authority having jurisdiction.

NFPA 72 requires one CO unit will be installed:

- Within 21 ft of any sleeping area.
- On every occupiable level.
- In any sleeping room that contains a combustion appliance.

In addition, the International Association of Fire Chiefs recommends installing a CO detector near or over any attached garage.

Install CO alarms in accordance with the manufacturer’s instructions, taking note of instructions for placement and height, as this can vary significantly by manufacturer.

Provide occupants the manufacturer’s written instructions.

A-3 Baseload Lighting Measures

FOR ALL BASELOAD LIGHTING MEASURES:

Provide occupants/owners with user's manual, warranty information, installation instructions, and installer contact information.

Permanently remove uninstalled equipment from job site and recycle or dispose of removed equipment and refrigerant in accordance with local and federal law (e.g., Part 761 in Title 40 of the Code of Federal Regulations).

Permanently decommission old equipment.

Lighting Replacement

Aligns with 7.0103.1

Discuss the lighting schedule with the client. At a minimum, replace any incandescent lamps that are on for one or more hours each day.

Educate client about incandescent lamp use, including using these lamps as little as possible.

Select replacement lighting that is appropriate for the intended application (e.g., enclosed, dimmable, potential for breakage, indoor vs. outdoor).

LEDs rated 2700-3000 K have similar color to incandescent bulbs.

Provide lighting level quality required for the intended application (e.g., task lighting, hazards lighting, nightlights) and approximate the lumen rating of incandescent lamp being replaced (see chart at right), except in circumstances where lighting reduction may be put into place (see Article below).

LED/Incandescent Lamp Equivalency Chart		
LED	**Incandescent**	**Lumens**
6 – 9 W	40 W	450 lm
8 – 12 W	60 W	800 lm
9 – 13 W	75 W	1100 lm
16 – 20 W	100 W	1600 lm
25 – 28 W	150 W	2600 lm

All replacement lamps are the highest level of efficiency within technology (e.g., LED bulbs) and are ENERGY STAR® qualified, equivalent or better, and UL approved.

New fixtures or lamps facilitate upgrade to future lighting technologies.

New lamps are rated no more than the rated wattage of fixture.

Install lighting in accordance with manufacturer specifications and applicable code (i.e., NFPA 70, NFPA 101, NECA/IESNA 500).

If applicable, clean lens and reflector before installing new bulb.

Install all electrical wiring according to applicable code (i.e., NFPA 70).

Lighting Reduction

Aligns with 7.0103.2, 7.0103.7

Replace or maneuver window coverings (e.g., blinds, shades, movable insulation) to maximize useful daylight where appropriate.

Follow IESNA protocols for appropriate light levels for certain tasks when designing delamping procedure.

Ensure final lighting levels are in accordance with ASHRAE 90.1 or 90.2.

Ensure final egress lighting levels are in accordance with NFPA 70 and 101.

Ensure that delamping does not impact required egress lighting, as required by ANSI/NFPA 101.

De-energize circuit and lock out power before work begins.

Remove bulbs or fixtures per plan ensuring that no open connections will remain after work is finished.

Terminate all unused electrical connections in appropriately covered junction box per NFPA 70.

Seal any penetrations created by removal as per ANSI/NFPA/ICC Fire Code.

If removed bulbs or fixtures meet retrofit standards and are operational, store them in a dry location for reuse.

Fixture Replacement

Aligns with 7.0103.3, 7.0103.4, 7.0103.5, 7.0103.6

FOR ALL FIXTURE INSTALLATIONS:

De-energize circuit and lock-out power before work begins.

Locate and install new fixtures in accordance with appropriate code (e.g., NFPA 101, NFPA 70, NECA/IESNA 500).

Ballast Replacement

Select pulse start, high-efficiency, electronic ballasts that meet the appropriate nationally recognized product standards (ANSI C82.1, ANSI C82.2, UL 924, UL 1029, NEMA) and have a ballast factor of 0.85 or greater.

Select ballasts that match the input and output voltage of the existing fixture, that fit within the existing enclosure, and will support the necessary wattage of the bulbs.

Install ballasts in accordance with manufacturer specifications.

Clean the lens and reflector once installation is complete.

Exit Sign Replacement

Select exit signs from the NEMA Premium Exit Sign List and that meet all applicable codes (UL 924, NFPA 70, and/or IBC and IFC, as appropriate).

Signs that include battery-backups that can maintain the total load for a minimum period of 1-1/2 hours and indicate system failure with visual and audible alarm.

Signs that can be attached to the existing outlet box.

Signs that are rated for a maximum of 5 watts per illuminated side.

Signs with at least a one year warranty.

Emergency Lighting Replacement

Select emergency light fixtures that are UL approved for location installed (i.e., indoor, outdoor, wet location).

Emergency light fixture has battery-backup that can maintain the total load for a minimum period of 1-1/2 hours, in accordance with section 700.12 of NFPA 70.

Security Lighting

Select security light fixtures that are UL approved for location installed (i.e., indoor, outdoor, wet location).

Security light fixtures provide the required lighting conditions with the lowest possible energy-use, are vandal-proof, are dark-sky approved and are ENERGY STAR® qualified, equivalent or better.

Aim light fixtures to minimize light emitted above the horizontal, beyond the perimeter of the property, and not directly into any window of a residence.

Clean the lens and reflector once installation is complete.

Install both photo and motion sensors and configure to only activate when sun is down and to switch off within five minutes if motion is not detected.

Lighting Controls

Aligns with 7.0104.1, 7.0104.2, 7.0104.3, 7.0104.4, 7.0104.5

FOR ALL CONTROL INSTALLATIONS:

Select controls that are compatible with the existing wiring and lighting fixture, and are UL approved and listed for the installed location.

Install control in accordance with NFPA 70 and manufacturer specifications, in a secure location, and in location appropriate enclosure (e.g., weatherproof) or protected from physical damage.

Occupancy Sensors

Do not install occupancy sensors in areas accessed for electrical and mechanical maintenance.

Set controls to match the intended use of the space (i.e., time off setting is not too short or too long).

Stand-Alone Timers

Select timer that has at least 10 hours of battery backup time, has at least two programmable schedules, and has an appropriate manual override.

Do not install timers for egress lighting required by NFPA 101.

Set timer to turn off exterior fixtures when there is sufficient daylight (civil twilight) or when lighting is no longer needed at night per ASHRAE 90.1 or 90.2.

Set timer to turn off interior fixtures when light is no longer needed in space.

Motion Control Sensors

Select sensor that is location- and climate-appropriate (e.g., outdoor weatherproof fixture).

Locate sensor where it will minimize false starts.

Set controls of motion sensor based on anticipated occupant usage or security needs.

Set control to turn off lighting if no motion is detected for a maximum of 15 minutes.

Outdoor Photo Sensors

Select sensor that is UL approved and listed for the installed location (e.g., UL 60730-1) and is location- and climate-appropriate (e.g., outdoor weatherproof fixture).

Select fixture that allows for replacement of photo sensor independently.

Position sensor to properly sense natural light, but shielded from artificial light sources (e.g., other outdoor lighting).

Bi-Level Controls

Select control that has an appropriate manual override.

Affix permanent labels near the switch location to indicate light level and fixture control.

A-4 Refrigerator and Freezer Replacement

Select an ENERGY STAR® qualified appliance, equivalent, or better.

Select appliance with a minimum one-year warranty that provides a replacement appliance if repeated issues relating to health, safety, or performance occur.

Ensure new appliance will not block access to light switches, cabinets, etc. and will fit through the smallest opening between the outside and installation location.

Install appliance according to manufacturer specifications and applicable code.

Permanently remove old appliance from job site and recycle or dispose of removed appliance and refrigerant in accordance with local and federal law (e.g., EPA Section 608 of Clean Air Act of 1990). Permanently decommission old appliance.

Provide occupants/owners with user's manual, warranty information, installation instructions, and installer contact information.

A-5 Insulation Certificate

Insulation certificate at a minimum must include:

- Installed insulation type.
- Coverage area.
- Installed thickness.
- Minimum settled thickness.
- Installed R-value.
- Number of bags installed.

The insulation certificate must be posted on the electrical panel.

Example of a filled-out insulation certificate:

Sample Certificate of Insulation

ADDRESS OF RESIDENCE: 123456 Country Rd, Someplace, MI 44444

NAME OF INSTALLER: Company Name Here / Worker Name Here

ADDRESS: Company Address Here

	Location	Insulation Type	Area SqFt.	Installed Thickness	R-Value	Manufacturer	Batch Number	Bag Amount
1	Sill	2-Part SPF	84	2 inches	14	Foam Company Name	123456	.25 Froth-Pak
2								
3	Foundation	2-Part SPF	672	2 inches	14	Foam Company Name	123456	1.75 Froth-Pak
4								
5	Attic	Cellulose	1500	15 inches	49	Insulation Company Name	654321	85
6								
7								
8								
9								
10								

COMPLETION DATE: _____

I HEREBY CERTIFY THAT THE INSTALLATION WAS CARRIED OUT IN CONFORMANCE TO ALL APPLICABLE STANDARD PRACTICES, CODES, AND REGULATIONS.

SIGNATURE OF AUTHORIZED OFFICIAL — DATE: 08/21/2025

COPY TO:
a) Client
b) Affixed to house at or near electrical panel
c) Weatherization Program Agency

Sample Certificate of Insulation

ADDRESS OF RESIDENCE: _____

_____

NAME OF INSTALLER: _____

ADDRESS: _____

	Location	Insulation Type	Area SqFt.	Installed Thickness	R-Value	Manufacturer	Batch Number	Bag Amount
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

COMPLETION DATE: _____

I HEREBY CERTIFY THAT THE INSTALLATION WAS CARRIED OUT IN CONFORMANCE TO ALL APPLICABLE STANDARD PRACTICES, CODES, AND REGULATIONS.

_____

SIGNATURE OF AUTHORIZED OFFICIAL DATE

COPY TO:
a) Client
b) Affixed to house at or near electrical panel
c) Weatherization Program Agency

A-6 Combustion Appliance Assessment

The following steps shall be completed for the purpose of placing the Combustion Appliance Zone (CAZ) under the greatest depressurization achievable given the weather/temperature conditions at the time of the inspection. Once it has been determined that the greatest possible depressurization has been achieved, the CAZ shall remain in this depressurized state during all spillage assessments and CO measurements conducted in the CAZ. (Step by step CAZ form located at the end of section 6).

1. Place all combustion appliances located within the CAZ in their standby mode and prepare for operation.

2. Fires in woodstoves and/or fireplaces shall be fully extinguished, with no hot coals or embers, prior to performing a depressurization test. Close fireplace dampers and any fireplace doors.

3. Close all building exterior doors and windows. Close all CAZ doors. Close the interior doors of all rooms except for rooms with an exhaust fan and rooms with central forced air system return. Outdoor openings for combustion air shall remain open.

4. Turn off any mechanical ventilation and forced air cooling or heating system blowers.

5. Using a calibrated manometer or similar pressure measuring device intended for this purpose, measure and record the baseline pressure in the CAZ with reference to (WRT) outside. Compare this measurement with subsequent pressure measurements to determine the greatest negative pressure achievable in the CAZ.

6. Turn on the following exhaust equipment: clothes dryers (check and clean the dryer filter and look for blockage at the external vent damper prior to operation), range hoods, and other exhaust fans. If there are speed controls, operate the exhaust equipment at the highest speed setting. Do not operate a whole house cooling exhaust fan.

7. Measure and record the pressure in the CAZ WRT outside.

8. Turn on any central forced air system blowers and measure and record the pressure in the CAZ WRT outside.

9. If the pressure in the CAZ becomes more negative WRT outside after the blower is turned on, the blower shall remain on during combustion appliance safety inspection.

10. If the pressure in the CAZ becomes more positive WRT outside after the blower is turned on, the central forced air system blowers shall be turned off during the combustion appliance safety inspection.

11. Open interior door(s) directly leading to the CAZ. Measure and record the pressure in the CAZ WRT outside.

12. If the pressure in the CAZ becomes more negative WRT outside after the door(s) are opened, the door(s) shall remain open during the combustion appliance safety inspection.

13. Starting with the appliance with smallest BTUh input rating, follow lighting instructions and place in operation. Adjust the thermostat or control so the appliance will operate continuously.

14. Spillage assessment and CO measurement in cold vent (except domestic water heaters).

- Spillage shall be assessed at five minutes of main burner operation.

15. Action levels for spillage occurring at five minutes of main burner operation shall be in accordance with Annex D, Table D.1.A.

16. CO measurement of undiluted flue gas shall be taken at five minutes of main burner operation. The CO measurement shall be compared with the appropriate CO threshold in Section 7.9.5, Table 1, CO Thresholds for Fossil Fuel-Fired Appliances (Table 1).

17. Action levels for CO exceeding the appropriate threshold in Section 7.9.5, Table 1 shall be in accordance with Annex D, Table D.1.B.

18. Spillage assessment and CO measurement in domestic water heaters or warm vent.

    - Spillage shall be assessed at two minutes of main burner operation.

    - Action levels for spillage occurring at two minutes of main burner operation shall be in accordance with Annex D, Table D.1.A.

19. Spillage testing must be completed for all natural-draft appliances. Spillage must first be tested under worst-case conditions and then repeated for natural conditions if the appliance fails under worst case. If an appliance fails spillage or CO at worst case depressurization, specify measures to correct CAZ depressurization.

20. CO measurement of undiluted flue gas shall be taken at five minutes of main burner operation. The CO measurement shall be compared with the appropriate CO threshold in Section 7.9.5, Table 1.

21. Action levels for CO exceeding the appropriate threshold in Section 7.9.5, Table 1 shall be in accordance with Annex D, Table D.1.B.

22. Multiple combustion appliances sharing chimney and/or venting system. When a chimney and/or venting system is shared by multiple combustion appliances, the auditor shall use the following procedures to test combustion appliances for spillage and measure CO level in undiluted flue gases.

    - Combustion appliances shall be tested in order from lowest BTUh input rating to highest BTUh input rating.

    - The appliance with the lowest BTUh input rating shall be assessed for spillage and CO measurement in undiluted flue gas shall be conducted in accordance with Section 7.9.2 (Cold Vent) or 7.9.3 (Warm Vent) of this document.

    - Upon completion of spillage testing and CO measurement of the first appliance, the auditor shall place the next largest BTUh combustion appliance in operation while the first appliance is still firing. Do not wait for the chimney to cool.

    - Retest the first appliance for spillage when the second appliance has reached two minutes of main burner operation. Test the second appliance for spillage immediately thereafter.

    - Measure CO level in the undiluted flue gas of the second appliance at five minutes of its main burner operation. Continue this process for each additional commonly vented combustion appliance in order of BTUh input rating until all are running simultaneously.

- CO measurements shall be compared with the appropriate CO thresholds in Section 7.9.5, Table 1.

- Action levels

  - » Action levels for spillage on each appliance shall be in accordance with Annex D, Table D.1.A.

  - » Action levels for CO for each appliance shall be taken in accordance with Annex D, Table D.1.B

Table 1: CO Thresholds for Fossil Fuel-Fired Combustion Appliances (from ANSI/BPI-1200, Section 7.95)

CO Thresholds for Fossil-Fuel Fired Combustion Appliances	
Appliance	**Threshold Limit**
Central Furnace (all categories)	400 ppm air free [4]
Boiler	400 ppm air free
Floor Furnace	400 ppm air free
Gravity Furnace	400 ppm air free
Wall Furnace (BIV)	200 ppm air free
Wall Furnace (Direct Vent)	400 ppm air free
Vented Room Heater	200 ppm air free
Unvented Room Heater	200 ppm air free
Water Heater	200 ppm air free
Oven/Broiler	225 ppm as measured
Clothes Dryer	400 ppm air free
Refrigerator	25 ppm as measured
Gas Log (gas fireplace)	25 ppm as measured in vent
Gas Log (installed in wood burning fireplace)	400 ppm air free in firebox

CAZ (Combustion Appliance Zone) Pressure Test Procedure

Step 1

- ☐ Make sure combustion appliances are unable to operate during set-up
- ☐ Remove forced air furnace filter (replace cover)
- ☐ Close all windows, doors, and other openings to the exterior of the structure
- ☐ Close fireplace and woodstove dampers
- ☐ Set up a gauge to read CAZ pressure with reference to (WRT) the outside

Record the baseline CAZ pressure: [ ] Pa (can be done CAZ door both open and closed)

- ☐ Turn on clothes dryer and all exhaust fans
- ☐ Use a blower door to simulate fireplace flow as needed (300 cfm or appropriate)
- ☐ Open supply registers in the house – close the registers in the CAZ
- ☐ Close all interior doors off the main body except to rooms that contain an exhaust fan

Obtain two CAZ pressure measurements with the forced air blower OFF: One with the CAZ door open and one with the door closed (long term averaging makes this process quicker).

	CAZ Door **Open** (1)	CAZ Door **Closed** (2)
Fan **OFF**	[ ] Pa	[ ] Pa

Note: There will be from 1 to 4 pressure measurements taken depending upon whether a blower or CAZ door exists.

Step 2

- ☐ Operate the forced air system blower (on the highest speed it can be expected to operate)
- ☐ Close the doors to rooms with exhaust fans and smoke/pressure test the rooms to determine the appropriate door position (testing is done with the CAZ at your back)
- ☐ Also, smoke/pressure test the doors to bedrooms that contain return ducts
- ☐ Reposition the doors as necessary (positive pressure in rooms – door closed, negative pressure in rooms – door open)

Obtain two CAZ pressure measurements with the forced air blower ON: One with the CAZ door open and one with the door closed.

	CAZ Door **Open** (3)	CAZ Door **Closed** (4)
Fan **ON**	[ ] Pa	[ ] Pa

Note: For diagnostics, subtract the baseline pressure to get the actual level of depressurization due to exhaust fans, ducts, or doors.

The greatest negative pressure measured in any of the four quadrants would be considered "worst case" depressurization conditions for operational testing of combustion appliances.

- Diagnostics can now be performed using the four quadrant measurements to determine potential causes and appropriate repairs.

IMPORTANT:

- Any time you encounter a door you are unsure about positioning (ex: a bathroom in a bedroom or a CAZ with a door in a basement with a door at the top of the stairs), smoke/pressure test the door to determine its position. Complete twice – once with the fan on and once with the fan off.
- This procedure will cover most houses most of the time. Understand the concepts and apply them as needed in more complicated houses.

A-7 Applicable Links

ASHRAE 2016 Standard

Building Performance Institute - BPI 1200

Oak Ridge National Laboratory - ORNL Getting Started Guide for WAweb

Refrigerator Energy Usage (energy.gov)

Refrigerator Energy Usage (energystar.gov)

Air-Conditioning, Heating, and Refrigeration Institute - AHRI product performance details

Michigan Training & Education Center - MiTEC

Standard Work Specifications - SWS

Community Services Policy Manual - CSPM

A-8 Crew Leader Specific Guidance

Prior to work beginning:

It is important to inform a client of planned measures and material use. Resistance from a client to install any measures and/or materials planned as a result of NEAT/MHEA created work order should be addressed with either additional education and/or re-running the energy audit with a different but acceptable material to determine if the substitute material is cost-effective. If no cost-effective option for the material can be identified, the auditor should again explain and discuss the situation with the building owner or occupant.

If the building owner or occupant still declines a measure, not defined as a major measure, the auditor must include in the client file a comprehensive justification, including background/source documents that support the decision to skip a specific measure. All other weatherization measures must be installed.

If the auditor cannot access background/source documents that justify the building owner/ occupant's decision to decline a measure or the measure is defined as a "major measure" the situation must be fully documented in the client file, and the job must be deferred due to client refusal.

» **Inadequate training:**

A lack of training is not an allowable reason to skip measures. The standard procedure should be to postpone job(s) requiring major measures that cannot be implemented due to lack of trained staff until adequate training is acquired.

» **After a job has begun:**

Due to scheduling, measures are sometimes installed with a lower priority first. If during the installation process, the client declines a higher priority measure, work must stop at the time the client declines the higher priority measure. No further installation is allowed, and the job must be inspected by a Quality Control Inspector (QCI) and closed out as a completed unit. This should be clearly explained in client file documentation. Some agencies include a statement for client signature that states the client is aware and accepts all WAP rules, including the specific services and measures determined by an energy audit.

» **Optional Measures:**

The Optional Measures may be skipped for any documented reason (including declined by the client). Optional measures are not prioritized by the energy audit tool. The Optional Measures are listed in the "Optional Measures" section of CSPM 606.1.