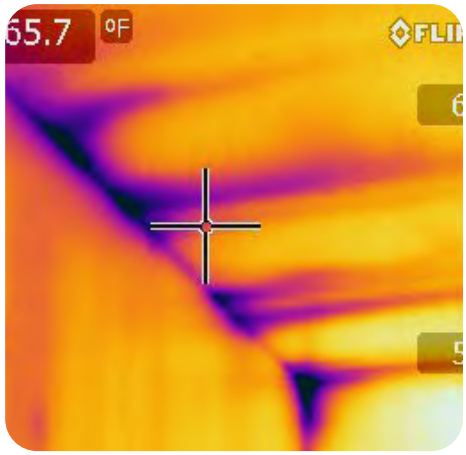
Weatherization Works

RETROFITTING KANSAS

STANDARD WORK SPECIFICATION-ALIGNED FIELD GUIDE





Version 2021.3
Effective 7/1/21

KANSAS HOUSING

Last updated 3 May 2021
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.nrel.gov

Contents of SWS-Aligned Field Guide

Pages not numbered consecutively, to encourage printing of individual Job Aids

Weatherization Works

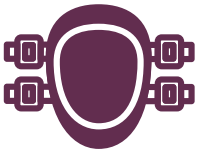
PERSONAL PROTECTIVE EQUIPMENT (PPE) GUIDE

Safety Glasses

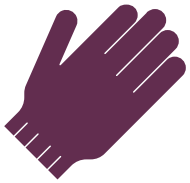
Hearing Protection

Hard Hat

Bump Cap



Knee Pads



Gloves – Leather or Heavy Cloth

Gloves – Nitrile

Tyvek Suit

Boot/Shoe Covering

N-95 Mask without Exhale Valve

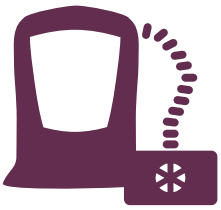
N-95 Mask with Exhale Valve

Half-Face P-100 Respirator

Half-Face P-100 Respirator with OV Valve

Full-Face P-100 Respirator

Full-Face P-100 Respirator with OV Valve



Powered Air Purifying Respirator

Cooling Vest

1

Weatherization Works

1-1 INTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP

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

TOOLS

- Zip Walls
- HEPA Vacuum
- Hand Tools or 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

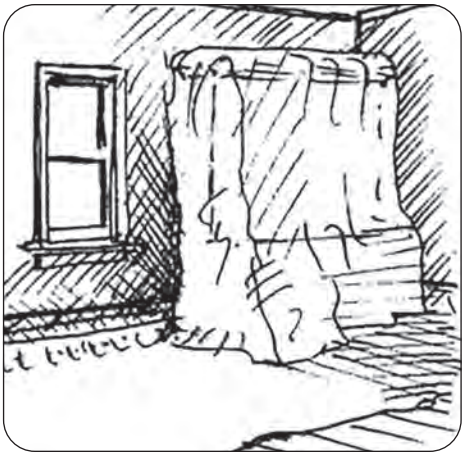
PPE

** weather dependent*

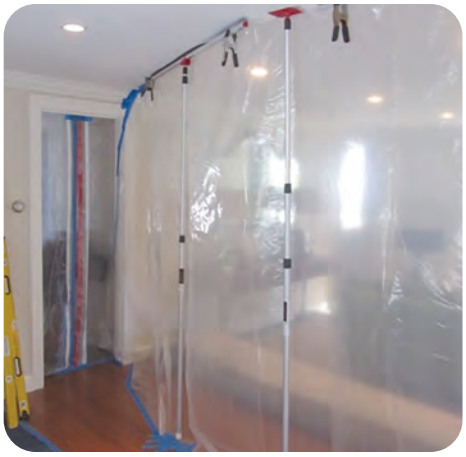
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

1-1 INTERIOR LEAD-SAFE WEATHERIZATION

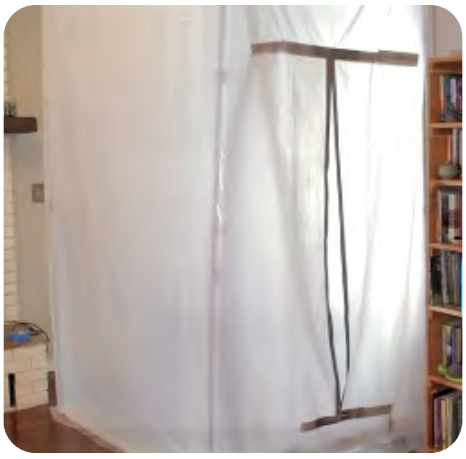


1. Move furniture out of work area and, if it cannot be removed, securely cover horizontal with plastic sheeting



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

NOTES

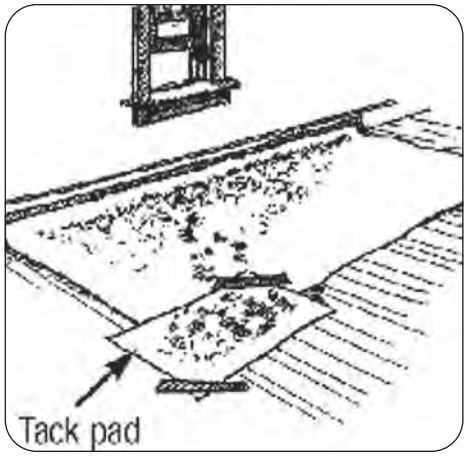
Half and Full-face respirators, required for Lead Renovation work, must be fit-tested on all workers at least once a year. The respirator must form a tight seal at the face and neck.

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

Weatherization Works

1-1 INTERIOR LEAD-SAFE WEATHERIZATION

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



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

NOTES

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

Weatherization Works

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

NOTES

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

Follow all KDHE requirements.

1

Weatherization Works

1-2 EXTERIOR LEAD-SAFE WEATHERIZATION

Aligns with Lead RRP

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

TOOLS

- HEPA Vacuum
- Hand Tools or 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

PPE

** situation dependent ** weather dependent*

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

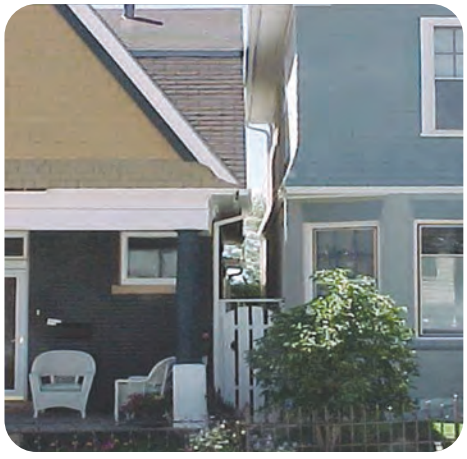
Weatherization Works

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

NOTES

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.

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

Weatherization Works

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

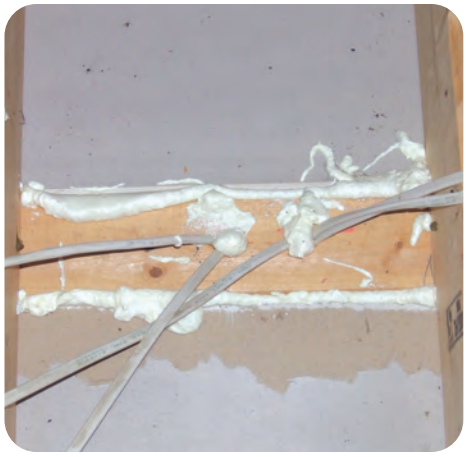
NOTES

Follow all KDHE requirements.

Weatherization Works

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

MATERIALS

- Caulk
- 1-part Polyurethane Spray Foam
- Mastic

PPE

** weather dependent*

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

Weatherization Works

2-1 AIR SEAL TOP PLATES IN ATTIC

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

Apply sprayfoam or mastic to gaps 1/4 inch to 2 inches wide

NOTES

Add backer rod or filler as necessary

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

Weatherization Works

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

MATERIALS

- Spray Foam
- Lumber for Support
- R-Board
- Polyiso
- 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.

Weatherization Works

2-2 AIR SEAL AN ATTIC SOFFIT OR LARGE OPENING

OPTION A – SEAL SOFFIT INTO CONDITIONED SPACE

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

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

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

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

Completely sealed drop soffits and chases minimize heat transfer.

NOTES

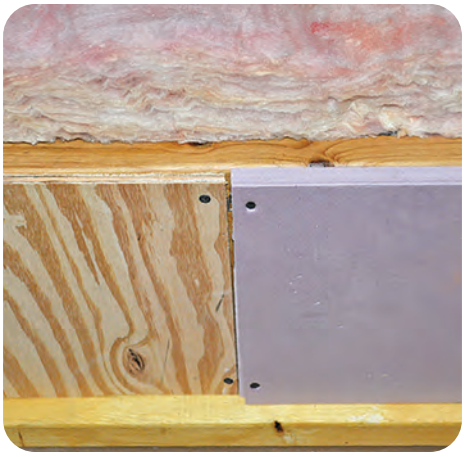
The entire opening will be spanned with rigid material, permanent, and support any load.

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

Weatherization Works

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, polyiso, or R-board

B-2. Seal around infill materials

NOTES

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

Weatherization Works

2-3 AIR SEAL AN ATTIC CHASE OR SMALL OPENING

Aligns with SWS 3.0102.1

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

TOOLS

- Measuring Tape
- Drill
- Utility Knife
- Caulk Gun
- Spray Foam Gun

MATERIALS

- Polyiso
- R-board
- 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.

Weatherization Works

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 R-board, polyiso, 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

NOTES

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

Weatherization Works

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
- Sprayfoam Gun
- Caulk Gun

MATERIALS

- R-board / polyiso
- Gypsum Board
- Plywood
- Plastic-wrapped/ Bagged Fiberglass Batts
- 1-part Sprayfoam
- Caulk
- Mastic
- Mechanical Fasteners

PPE

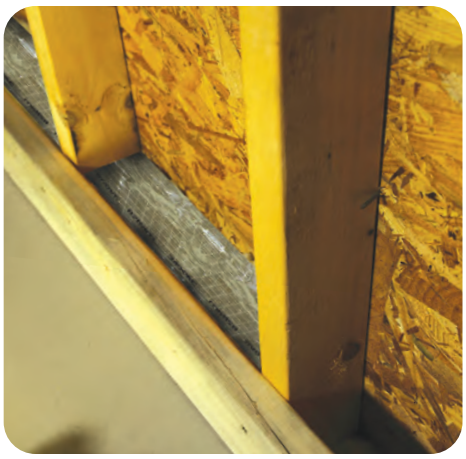
** weather dependent*

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

Weatherization Works

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, R-board, or bagged fiberglass batts

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

4. And securely fastened rigid material to withstand pressure of dense-packing beneath

5. Seal any remaining gaps with caulk or 1-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.

Weatherization Works

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 thermal boundary is maintained

TOOLS

- Caulk Gun

MATERIALS

- Caulk

NOTES

See individual job aid 3-2 for non-IC rated lights.

PPE

** weather dependent*

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

Weatherization Works

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

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

PPE

** weather dependent*

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

Weatherization Works

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

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

Weatherization Works

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

NOTES

Spray foam will not be used in spaces that will be exposed to habitable living spaces. EXCEPTION- Professionally applied Rim and Band.

PPE

** situation dependent ** if cutting lumber*

TOOLS

- Saw
- Drill
- Measuring Tape
- Utility Knife
- Caulk Gun
- Spray Foam Gun

MATERIALS

- Caulk
- R-board / polyiso
- Lumber
- Gypsum Board
- 1-part Spray Foam
- Mechanical Fasteners
- Backer Rod

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

Weatherization Works

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 to locate 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

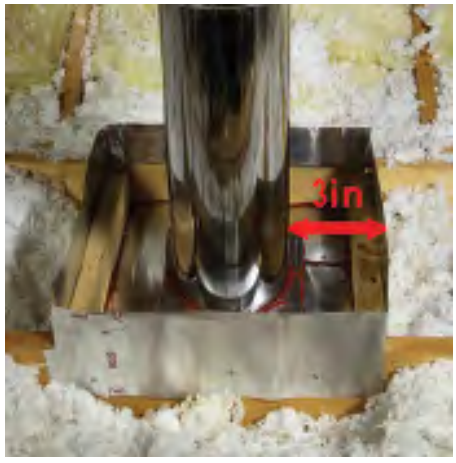
Photo credits: REUK.co.uk – After; Home Insulation of Syracuse – Step1 and Step 2

1

Weatherization Works

3-1 SEAL AROUND CHIMNEYS AND FLUES

Aligns with SWS 3.0102.2



BEFORE

✗ Even high-temperature sites need air sealing

AFTER

✓ Maintain appropriate clearance from 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*

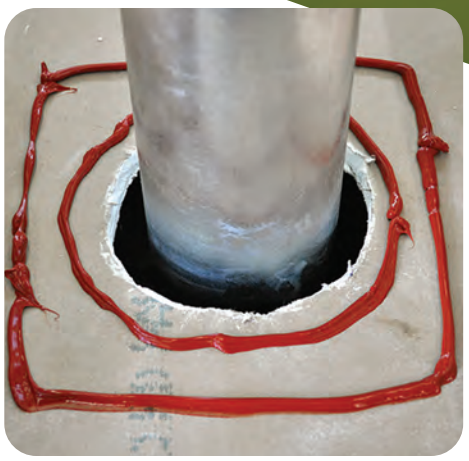
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

3-1 SEAL AROUND CHIMNEYS AND FLUES

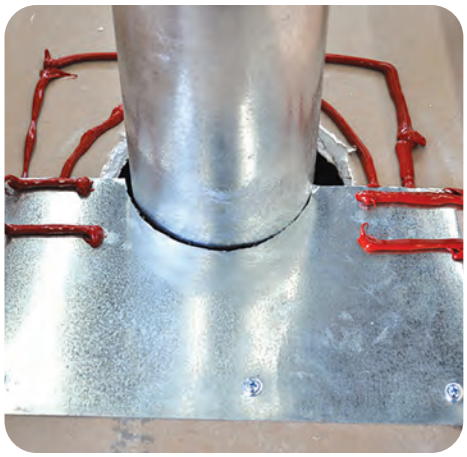
1. Select high-temperature caulk sealant that will adjust to temperature differences between materials

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

NOTES

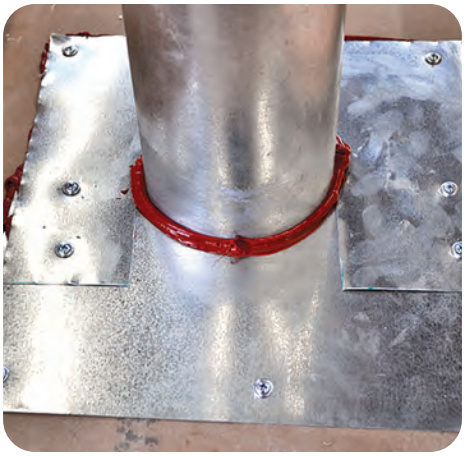


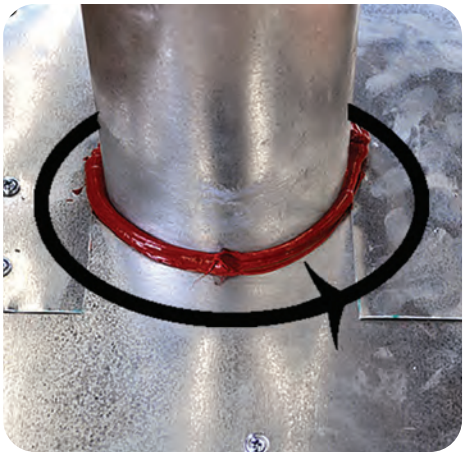
4. Install first layer of metal sheeting and apply additional caulk to complete new perimeter for second layer of sheeting

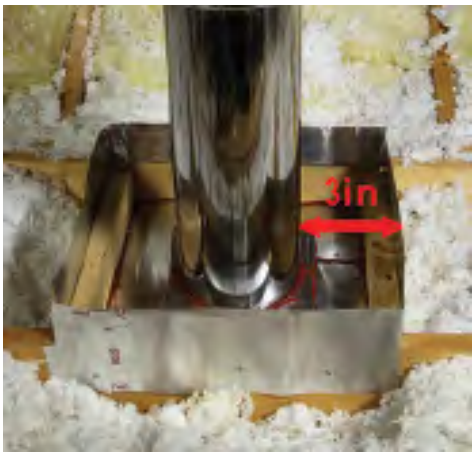
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

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 bead of high-temperature caulk around flue at backing to seal remaining gaps < 1/4 inch

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

NOTES

Refer to Local Codes. B-vent typically requires a 1 inch clearance and single wall typically requires 6 inches of clearance.

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

1

Weatherization Works

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

AFTER

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

Commercially available fire-rated air barrier systems may also be used. A full metal enclosure that is airsealed, provides the required clearances, and is not insulated on top, also meets the specification.

TOOLS

- Measuring Tape
- Utility Knife
- Caulk Gun

MATERIALS

- 5/8 Gypsum Board
- High-Temperature Caulk
- 100% Silicone Sealant

PPE

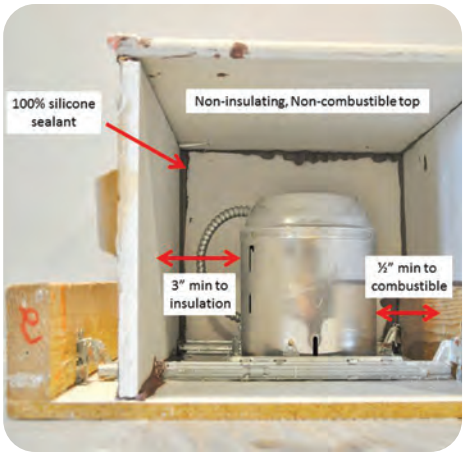
** situation dependent*

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

Weatherization Works

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 inches of clearance from lamp to insulation on all sides, at least 1/2 inch from any combustible material, such as wood

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

NOTES

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.

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

Weatherization Works

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

NOTES

With the help of a licensed electrician, there is also the option of replacing old can lights with air-tight units or LED retrofit inserts. Check program requirements.

See job aid 2-5 for IC rated lighting.

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

Weatherization Works

4-1 PREPARE ATTIC FLOOR FOR INSULATION

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

BEFORE YOU BEGIN

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

✓ Cover junction boxes and attach flag for visibility

PPE

** if cutting lumber or sheet metal ** situation dependent *** if cutting lumber*

TOOLS

- Non-Contact Tester
- Utility Knife
- Drill
- Hole Saw
- Caulk Gun
- Staple Gun
- Metal Snips
- Nibbler

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

Weatherization Works

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 inches of gap for airflow

MATERIALS

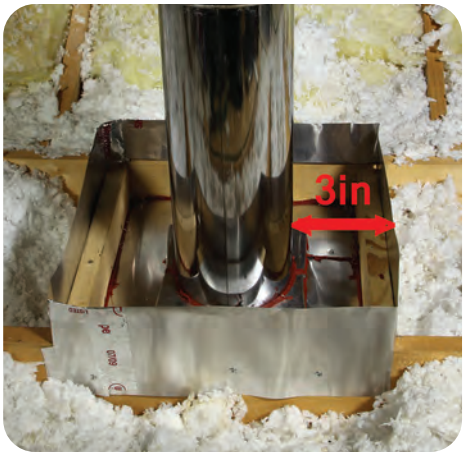
- Plywood
- Drywall
- R-board / polyiso
- Junction Box Covers
- Flags
- Vent Caps
- Rigid Duct
- Mechanical Fasteners
- Foil Tape
- R-8 Duct Insulation
- Soffit Baffles
- Depth Rulers
- 26-Gauge Steel Sheeting
- High-Temperature Caulk

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

Weatherization Works

4-1 PREPARE ATTIC FLOOR FOR INSULATION

5. Depth rulers installed, 1 per 300 square feet



6. All dams are built, as needed

NOTES

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

Maintain a minimum of 3" clearance around live knob and tube wiring.

Mark all live K&T wiring with caution tape that is visible from 5 feet away and post appropriate signage.

NEC guidelines and local jurisdictions are very particular on the treatment of knob & tube wiring. A licensed electrician is not required to inspect and certify Knob and Tube (K&T) wiring unless there is concern about the safety of it's condition or it's required by local code. Insulation may be applied under K&T as long as the proper air gap is maintained. Batt insulation as a dam is allowed. The practice of using a batt to cover K&T during blowing and then removing it to create an air gap is allowed. If left in place, add attic an entrance signage that states "CAUTION Live Knob & Tube Wiring Present"

Insulation dams will be installed where necessary and appropriate. Where building the dam is cheaper and accessible, said dam must be installed. When the conditioned space to be insulated is adjacent to unconditioned space (ie. garages and porches), it is acceptable to omit the insulation dam and blow insulation over the area as long as it's cheaper to do so and not in excess.

1

Weatherization Works

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
- Rigid Foam Insulation Board
- 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.

Weatherization Works

5-1 DAM, SEAL & INSULATE AN ATTIC HATCH

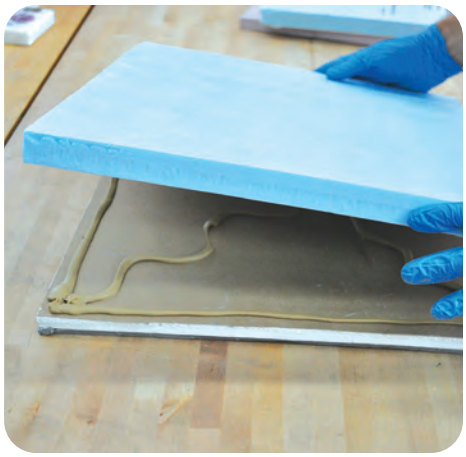
1. Rigid, durable attic hatch blocking/dam is installed in a permanent way

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

3. Cut hatch size for "friction fit" and air seal bottom of hatch with q lon type weatherstripping

NOTES

Photo #3 shows foam tape. Q lon type weather strip is the expectation.

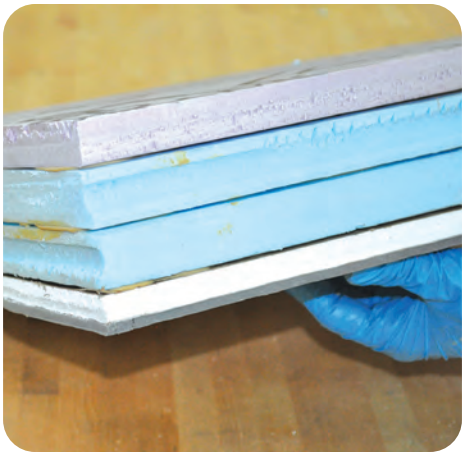


4. Cut and stack rigid foam insulation, gluing with appropriate adhesive, to build up R-value

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

Weatherization Works

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 to air seal at these doorways too. Hold vertical accesses closed with latch if necessary

NOTES

Paint / seal new surfaces to prevent moisture intrusion.

New hatches must be finished to match the surrounding ceiling.

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

Weatherization Works

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 down into the home

AFTER

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

MATERIALS

- R-board
- Latches
- Polyiso
- Plywood
- 1-Part Spray Foam
- Spray Adhesive
- Caulk Adhesive
- Foil Tape
- Mechanical Fasteners
- Weatherstripping

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.

Weatherization Works

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

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

2. Insulate top and sides of dam cover, to appropriate R-value , equal to surrounding area.

3. Air seal all edges of trim

4. Air seal with q lon type weatherstripping

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

NOTES

An inoperable whole house fan can be treated the same as a pull- down stairway.

Note that fan enclosures must be insulated to a minimum of R-20

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

Weatherization Works

6-1 INSULATE AN UNFLOORED ATTIC

Aligns with SWS 4.0103.2, 4.0103.4, 4.0103.6

BEFORE

Ensure that 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

NOTE - Fiberglass insulation will be utilized for manufactured homes and cellulose will be utilized for stick built homes unless the work scope specifies otherwise. Cellulose will never be allowable for manufactured homes.

PPE

** situation dependent*

TOOLS

- Measuring Tape
- Insulation Machine
- Staple Gun

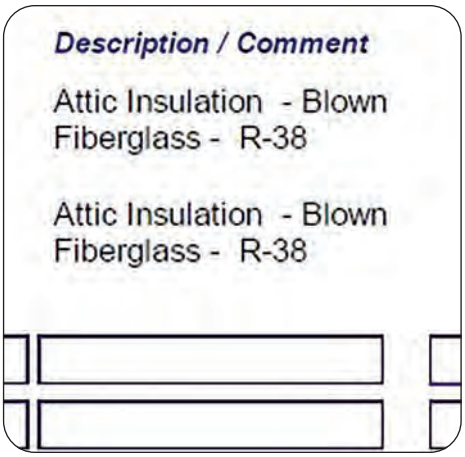
MATERIALS

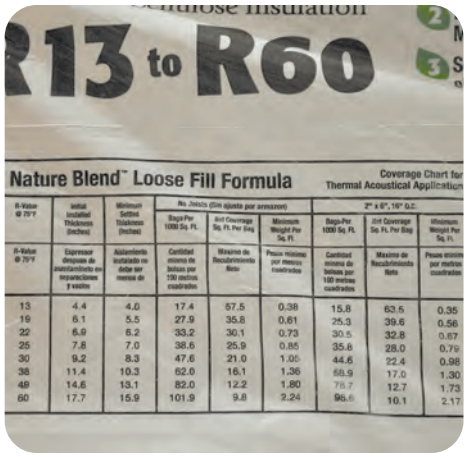
- Loose fill fiberglass or cellulose (as per work order)
- Staples

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

Weatherization Works

6-1 INSULATE AN UNFLOORED ATTIC

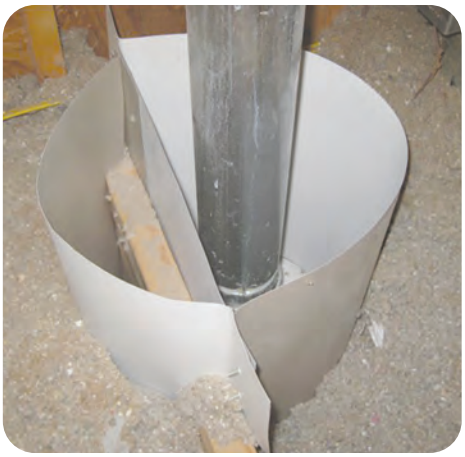




1. Verify against work order that correct insulation material is being installed

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 that insulation does not get into dammed-off areas, such as around chimneys and flues and inside soffit baffles

5. When complete, post insulation certificate by attic entrance

NOTES

List coverage area, thickness, R-value, and installer signature and date on the certificate.

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

Weatherization Works

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
- R-board / Polyiso
- 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.

Weatherization Works

6-2 INSULATE UNDER A FLOORED ATTIC

1. Ensure that 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

NOTES

4. Occasionally a homeowner may not want the attic floor to be disturbed. The cavities can also be accessed from below through the ceiling, particularly in garage spaces

Weatherization Works

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

7. Fill and reseal access holes to prevent air movement

NOTES

Living spaces over garages are typically insulated via drill and blow from the garage interior.

Photo credit: Home Insulation of Syracuse – After

Weatherization Works

6-3 INSULATE AN ATTIC STAIRWAY

Aligns with SWS 4.0104.1, 4.0104.2, 4.0104.3, 4.0104.4, 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

PPE

** situation dependent*

MATERIALS

- Kraft-Faced Fiberglass Batts
- Loose Cellulose or Fiberglass Insulation
- Netting
- Furring Strips
- Staples
- Mechanical Fasteners
- R-board
- Polyiso
- 1-Part Spray Foam
- Plywood
- Gypsum Board
- House Wrap

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

Weatherization Works

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 3.5 pounds per cubic foot

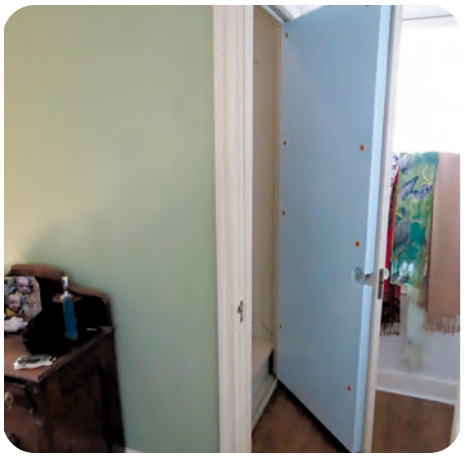
6. If walls are enclosed from attic side, drill holes in stairways walls, with client permission

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

Weatherization Works

6-3 INSULATE AN ATTIC STAIRWAY

7. Dense pack stairway walls



8. Weatherstrip and insulate door

9. Insulate under stairway and seal off insulation from conditioned space in home

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

11. Plug access holes from blown insulation

NOTES

1

Weatherization Works

7-1 PREPARE A MANUFACTURED HOME CEILING FOR INSULATION

Aligns with SWS 4.0103.6, 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.

All obvious ceiling penetrations will be air sealed.

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

- Measuring Tape
- Utility Knife
- Zip Tie Tensioner

MATERIALS

- R-8 minimum Flex Duct insulation
- Duct Insulation with Vapor Retarder
- Spray Adhesive
- Mastic
- UL 181 Fiberglass Mesh Tape

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.

Weatherization Works

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 dam around non IC-rated

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

NOTES

Check with your state program to find out deferral thresholds and procedures

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

1

Weatherization Works

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. Insulation the ceiling cavity to the workscope specified R-value

3. Continue throughout house to ensure even coverage and no gaps

4. Seal all holes. Plastic plugs are allowed with written client permission

PPE

TOOLS

- Hole Saw
- Vacuum
- Insulation Machine
- Caulk Gun

MATERIALS

- Fiberglass Loose Insulation
- Plugs
- Sealant

NOTES

Equidistant holes will be drilled in a straight row parallel to the longitudinal exterior wall of the ceiling. There will be, at a minimum, one hole between each roof truss.

Fiberglass insulation will be installed to a density of 1.5 to 1.6 pounds per cubic foot.

Cellulose insulation is NOT allowed for use in manufactured homes.

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

1

Weatherization Works

8-1 AIR SEAL ABOVE THE KNEE WALL

Aligns with SWS 3.0101.1, 3.0102.11

BEFORE

✗ Knee walls are part of the thermal and pressure boundary

AFTER

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

TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- Caulk Gun
- Spray Foam Gun

MATERIALS

- R-board / polyiso
- Plywood
- Gypsum Board
- Lumber
- Mechanical Fasteners
- Caulk
- Spray Foam
- Mastic

NOTES

PPE

** if cutting lumber ** situation dependent*

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

Weatherization Works

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 (R-board, 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.

Weatherization Works

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

- R-board / polyiso
- 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.

Weatherization Works

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 (R-board, 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

NOTES

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

Weatherization Works

8-3 INSULATE AN ATTIC KNEE WALL WITH BATTS

Aligns with SWS 4.0104.2, 4.0104.3

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
- Staple Gun

MATERIALS

- Fiberglass Batts
- Staples
- Nylon Strap
- Mechanical Fasteners

PPE

** situation dependent*

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

Weatherization Works

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. Kraft-face should go to "warm in winter" side and batt should fill the entire bay for a grade 1 installation.

NOTES

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

1

Weatherization Works

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

- R-board / polyiso
- 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

Weatherization Works

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

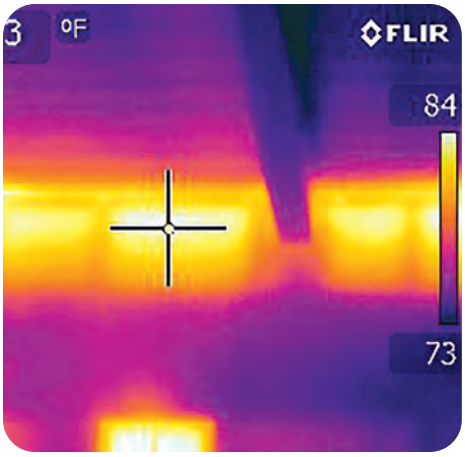
6. Seal access holes permanently and completely

NOTES

Weatherization Works

9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW

Aligns with SWS 4.0202.1



BEFORE

✗ Walls that are missing insulation or underinsulated are an opportunity for energy savings

AFTER

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

TOOLS

- Measuring Tape
- Utility Knife
- Pry-Bar
- Siding Remover
- Hole Saw
- Drill
- Insulation Machine

MATERIALS

- Plastic Sheeting
- Painters Tape
- Cellulose or Fiberglass per specs
- Plugs
- Caulk
- Spray Foam
- Mechanical Fasteners

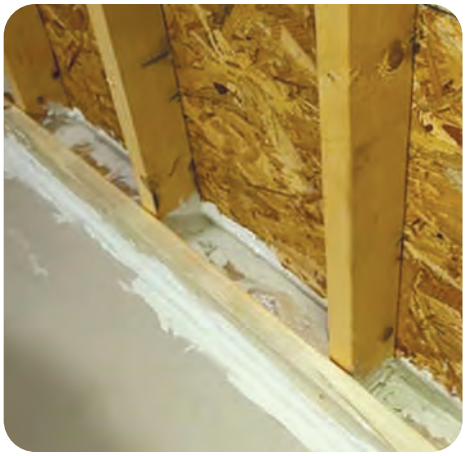
PPE

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

Weatherization Works

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. Ensure wall integrity is complete (no holes)

4. Remove siding as needed

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

6. Fill cavities completely. Cellulose will be installed to a minimum density of 3.5 pounds per cubic foot or to the maximum density structurally allowable.

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

Weatherization Works

9-1 DENSE-PACK A SIDEWALL VIA EXTERIOR BLOW

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

8. Patch holes. Patches must prevent visible air movement at 50 PA of pressure differential using smoke or other approved methods.

9. Replace and/or repair siding

NOTES

Sidewall dense pack insulation is not allowable if live knob and tube wiring is present in the cavity to be insulated.

Exterior sidewall work must not result in any visible work areas or plugs.

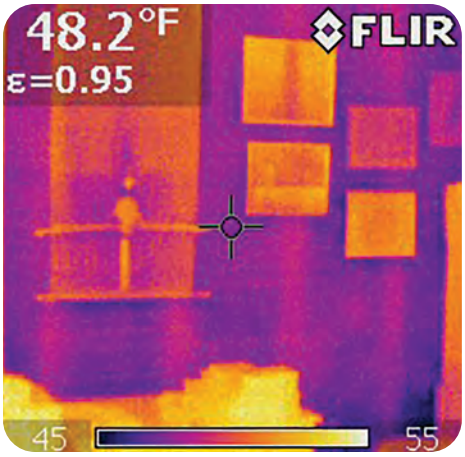
The use of plastic plugs will be allowed in garage walls and ceiling, CAZ closets, and other unfinished areas. The use of plugs will also be allowed in manufactured home ceiling and in wood paneling where permission is documented by the client.

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

Weatherization Works

9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW

Aligns with SWS 4.0202.1



BEFORE

✗ Older houses often are lacking in insulation

AFTER

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

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

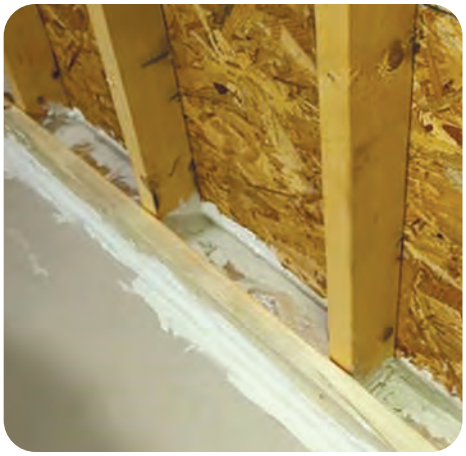
PPE

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

Weatherization Works

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

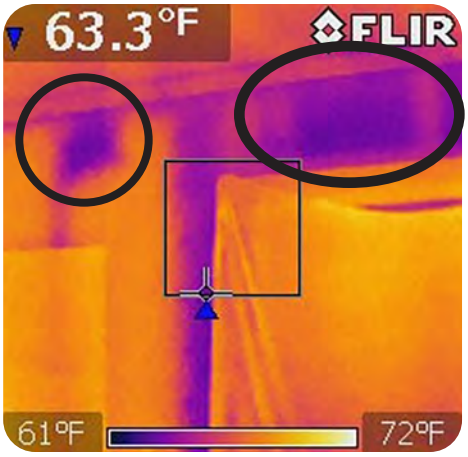
Interior sidewall work should strive for the highest quality of finished product. Clients shall be informed and agree to the type of sidewall patching performed. Sheetrock and lath and plaster holes should be finished to provide a smooth, nearly paint ready surface. Minimal to zero sanding is the expectation. The use of painted or stained chair rail to cover holes is acceptable.

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.

Weatherization Works

9-2 DENSE-PACK A SIDEWALL VIA INTERIOR BLOW



5. Fill cavities completely Cellulose will be installed to a minimum density of 3.5 lbs per cubic foot or to maximum density structurally allowable.

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

7. Patch holes. Use chair rail if preferred. Patches should near paint ready.

NOTES

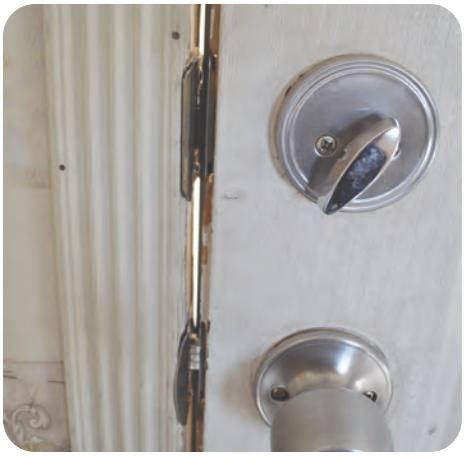
Sidewall dense pack insulation is not allowable if live knob and tube wiring is present in the cavity to be insulated. Follow all applicable KDHE regulations.

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

Weatherization Works

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 closes and opens 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

- Tape Measure
- 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.

Weatherization Works

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

NOTES

Weatherization Works

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

MATERIALS

- Mechanical Fasteners
- Caulk

PPE

TOOLS

- Measuring Tape
- Metal Snips
- Saw
- Drill
- Caulk Gun

NOTES

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.

Follow all applicable KDHE regulations.

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

Weatherization Works

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 that door sweep is appropriate length

2. Adjust threshold to ensure that it is seated tightly

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

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.

Weatherization Works

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 to make room for door bottom

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

7. Trim sweep to match width of door

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

NOTES

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

Weatherization Works

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, or
- Spray Foam Gun
- Caulk Gun

NOTES

PPE

MATERIALS

- 1-Part Spray Foam
- Backer Rod
- Machine Mesh
- Steel Wool
- Caulk

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

Weatherization Works

12-1 AIR SEAL SILL PLATE AND RIM JOIST

1. For exterior holes larger than 1/4 inch, 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 not only for current electrical and plumbing, but also 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.

1

Weatherization Works

12-2 INSULATE RIM JOIST

Aligns with SWS 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-inch gypsum board, to separate them from permanently habitable spaces

TOOLS

- Measuring Tape
- Utility Knife
- Spray Foam Applicator
- Spray Foam Gun
- Drill
- Caulk Gun

MATERIALS

- Polyisocyanurate Foam Board
- Plastic-Wrapped Fiberglass Batts
- R-board
- 1-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.

Weatherization Works

12-2 INSULATE RIM JOIST

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

2. Cut R-board or polyiso for each individual cavity

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

4. Ensure insulation is secured in place and will not move over time and air seal all edges

NOTES

As long as foam is not over 3.25 inches thick and space is not permanently habitable, insulation does not need to be covered by thermal barrier

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

1

Weatherization Works

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

✓ An insulated basement wall providing 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
- Caulk
- Fiberglass Kraft-Faced Batts
- Fiberglass batts or rigid insulation
- Staples
- Gypsum Board
- Luan
- Mechanical Fasteners
- Joint Compound
- Joint Tape

PPE

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

Weatherization Works

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 entire perimeter of foundation wall from ceiling to floor

5. Install a sealed air barrier on the conditioned side of the insulation.

NOTES

Inspectors should be attentive to evidence of pests and termites. If conditions warrant, review the Health and Safety Policy for pest control options, and/or notify the client of required action steps prior to weatherization.

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

1

Weatherization Works

12-4 INSULATE CONDITIONED CRAWLSPACE WALL

Aligns with SWS 4.0402.2

BEFORE

✗ Unvented crawlspaces are sometimes considered to be part of the conditioned space, so the walls need insulation

AFTER

FINAL CHECKLIST

✓ Insulation is or has class II vapor retarder

✓ Vapor retarder faces conditioned space

✓ Insulation laps over ground vapor retarder approximately 1 foot at foundation wall

TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Spray Foam
- Half- or Full-Face Respirator

MATERIALS

- R-19 batt, R-board, or polyiso
- Nylon Fasteners

Note that kraft paper is rated as a class II vapor retarder.

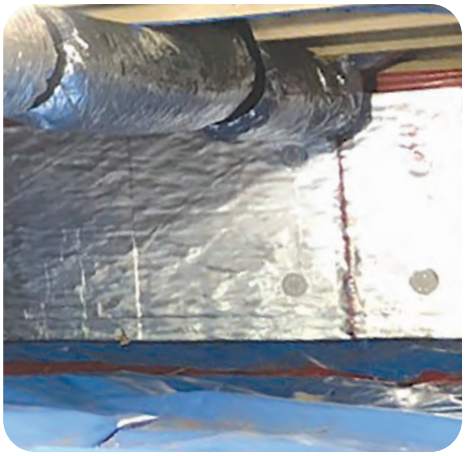
PPE

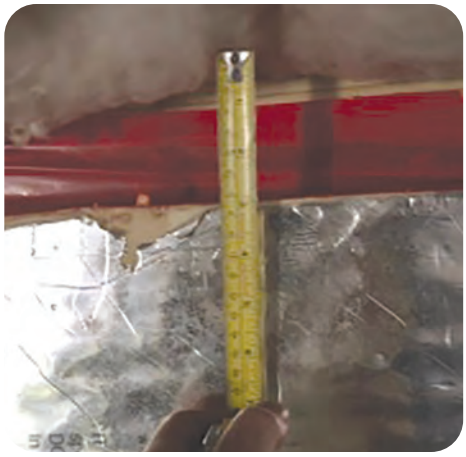
** if using two-part*

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

Weatherization Works

12-4 INSULATE CONDITIONED CRAWLSPACE WALL





1. Use a fire-rated material

2. Attach insulation in a durable manner

3. Leave a 3-inch termite inspection gap between the bottom of the sill plate at the top of the insulation, if needed

NOTES

Foundation vents will not be modified where local codes prevent modification. Ground moisture barriers and foundation insulation will not be installed where bulk water intrusion/standing water is a concern. Floor airsealing and insulation should be used in these applications, as applicable and audit approved. Where crawlspaces are to be included in the conditioned volume, foundation vents are to be sealed from the interior with rigid board. Where floors are insulated and vents are left operable, leave floor insulation back a few inches to allow full operation of vents.
Foundation insulation will not be installed where foundation vents remain operable.

R-19 fiberglass batt insulation may also be used. R-19 vinyl-faced, metal building insulation or wall batt insulation may be used. Insulation should be attached to the entire wall surface with appropriate fasteners. Install insulation with no significant voids or edge gaps. Foundation insulation will only be used in conjunction with a ground moisture barrier. Draped insulation shall extend down the wall and extend 1 foot from the wall along the ground.

Inspectors should be attentive to evidence of pests and termites. If conditions warrant, review the Health and Safety Policy for pest control options, and/or notify the client of required action steps prior to weatherization.

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

Weatherization Works

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-inch gap

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

TOOLS

- Caulk Gun
- Spray Foam Gun
- Utility Knife

MATERIALS

- Caulk Sealant
- One-Part Spray Foam
- Backer Rod

PPE

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

Weatherization Works

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 inch 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.

Weatherization Works

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
- Caulk Gun

MATERIALS

- One-Part Spray Foam
- R-board
- Caulk
- Polyiso
- Mechanical Fasteners

PPE

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

Weatherization Works

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 inches

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

NOTES

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

Weatherization Works

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

TOOLS

- Measuring Tape
- Utility Knife
- Saw
- Drill
- Spray Foam
- Caulk Gun
- Chip Brush

MATERIALS

- R-board
- Polyiso
- Gypsum Board
- Lumber
- Mechanical Fasteners
- 1-Part Spray Foam
- Mastic
- Caulk

PPE

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

Weatherization Works

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

Installations and air sealing must be professional in appearance.

Photo credit: InterNACHI – Before

Weatherization Works

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
- R-board or polysio
- Mechanical Fasteners

PPE

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

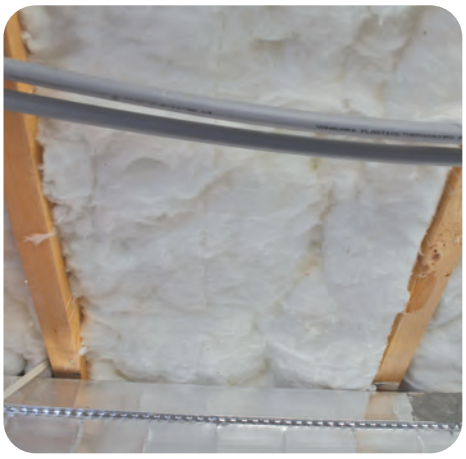
Weatherization Works

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

NOTES

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

Weatherization Works

14-1 INSULATE A SUBFLOOR WITH BATTS ABOVE UNCONDITIONED SPACE

5. Batts are in good contact with subfloor

6. Batts 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 or exposed floors, a rigid barrier is an extra layer of protection

NOTES

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

1

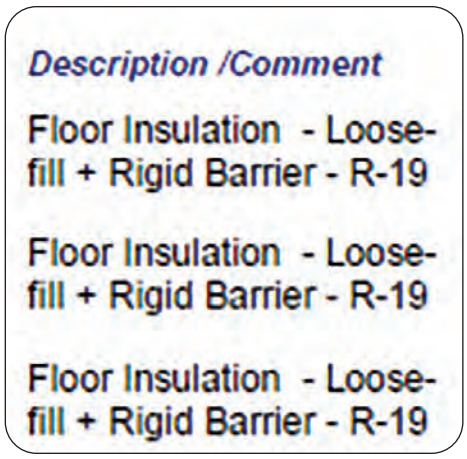
Weatherization Works

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

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



✓ Review work order to verify if dense-pack or loose fill is required. Netting a subfloor will mean loose fill, but a rigid barrier can mean either.

PPE

TOOLS

- Measuring Tape
- Utility Knife
- Scissors
- Caulk Gun
- Insulation Machine
- Pressure Gauge
- Hole Saw

MATERIALS

- Netting
- Rigid Barrier
- R-board or polyiso
- Staples
- Mechanical Fasteners
- Caulk
- Cellulose or Fiberglass Loose Insulation

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

Weatherization Works

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

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 to correspond with work order requirements

6. Fill cavity completely to density required by work order

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

Weatherization Works

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 air tight

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

NOTES

10. Keep staples close together

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

Weatherization Works

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

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

12. Cut access hole for fill tube

13. Loose fill netting to required density

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

NOTES

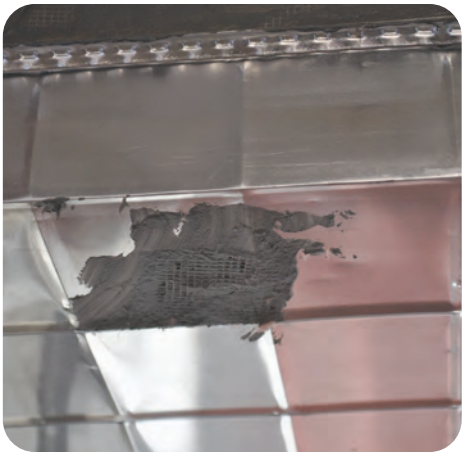
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

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

SOFT BELLY REPLACEMENT: Attach belly material at opposite ends of spanned section using rigid support material (i.e., wooden furring strips).
Attach belly material to rigid support material by wrapping it around the rigid support material a minimum of 2 times and mechanically fastening every 6".
Attach rigid support material to belly at every joist or at a maximum of every 2' with mechanical fasteners.

RIGID BELLY REPLACEMENT: Attach patches using mechanical fasteners spaced no more than 6" apart
Use mechanical fasteners that incorporate washers/caps that prevent fasteners from being pulled through belly material

PPE

TOOLS

- Measuring Tape
- Utility Knife
- Drill
- Insulation Machine
- Pressure Gauge
- Saw

MATERIALS

- Belly Wrap
- House wrap
- Caulk
- Mechanical Fasteners
- Mastic
- Spray Foam
- R-board or polyiso

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

Weatherization Works

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

LOOSE FIBERGLASS will be utilized in all manufactured home applications.
Cellulose will not be utilized in manufactured homes due to weight and moisture concerns.

CROSSOVER ducts will be supported, off the ground, with 1.5 inch wide or greater material, installed every 4' or less, without crimping or pinching the ductwork or reducing the interior dimensions.

PENETRATIONS will be air sealed prior to installing insulation and patches.
Dense pack outriggers, loose fill center belly

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.

Weatherization Works

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 inches larger than hole in barrier

7. Stitch staple patch to ensure permanent adhesion

NOTES

Manufactured Housing with typical skirting will be considered an open crawlspace and no vapor barrier is warranted.

Manufactured housing with an enclosed, unvented area below the belly (typical of permanent foundations) will be treated like enclosed crawlspaces and will have a vapor barrier installed. If access to the entire crawlspace is impossible, cover all accessible areas. Overlap seams in vapor barrier by at least twelve inches, and seal them with waterproof tape and/or polyurethane caulk or adhesive. Wrap and cover support piers at least twelve inches high.

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

Weatherization Works

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 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.

Weatherization Works

16-1 INSTALL A CRAWLSPACE VAPOR RETARDER

1. Clear out storage and debris

2. Select appropriate materials, 6 mil minimum.

3. Spread out plastic as flat as possible

NOTES

Ground moisture barrier shall extend a minimum of 6 inches up the foundation walls and pillars and must be mechanically fastened or sealed with bonding agents. Best practice is to extend the moisture barrier up the foundation wall to above the exterior grade, without contact with the sill plate or any wood. This allows for a termite inspection and keeps moisture vapor from contacting wood. Barrier must be attached with a durable connection. Best practices include adhesive and mastic together, or mechanically fastened. When ground moisture barrier is installed on sloping ground, it will be fastened to ground with durable fasteners or ballast. The ground moisture barrier will not interfere with the established drainage pattern. Interior drainage collection points will be accessible from above and below the ground moisture barrier.

4. Extend plastic a minimum of 6 inches up walls, piers and columns

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

Weatherization Works

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 durable way: e.g. tape, sealant, screws

7. Use ballast to hold down vapor retarder as necessary

NOTES

Foundation vents will not be modified where local codes prevent modification.
Ground moisture barriers and foundation insulation will not be installed where bulk water intrusion/standing water is a concern. Floor airsealing and insulation should be used in these applications, as applicable and audit approved.
Where crawlspaces are to be included in the conditioned volume, foundation vents are to be sealed from the interior with rigid board. Where floors are insulated and vents are left operable, leave floor insulation back a few inches to allow full operation of vents.
Foundation insulation will not be installed where foundation vents remain operable.

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

1

Weatherization Works

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 resultant mold issues in crawlspace

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 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.

Weatherization Works

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 inches

3. Spread out plastic as flat as possible

4. Plastic needs to be fastened in durable way: e.g. tape, sealant

5. Ensure plastic extends a minimum of 6 inches up walls, piers and columns and is securely attached

NOTES

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

Weatherization Works

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
- Worm-Drive Clamps
- Backdraft Damper
- Duct Insulation
- Foil Tape

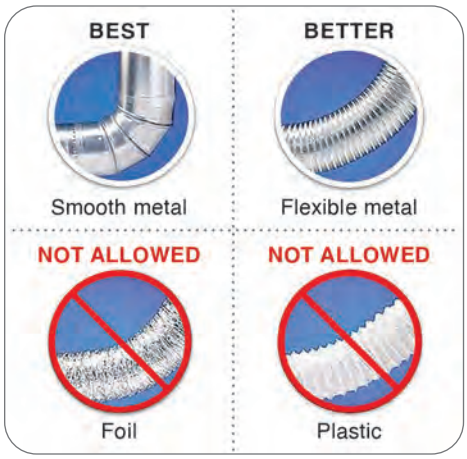
PPE

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

Weatherization Works

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

3. Correct fasteners are used (no screws penetrating into duct)

NOTES

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.

Weatherization Works

17-1 VENT A CLOTHES DRYER

5. Termination has backdraft damper and no cage

6. Duct in unconditioned space is insulated

7. If duct run must exceed 35 feet, install booster fan

NOTES

Insulate dryer ducts installed outside of the thermal boundary to a minimum of R-8.

Select dryer transition ducting materials that are UL 2158A approved and less than 8 feet in total length with no joints.

Select primary dryer ducting material that is 28 gauge metal with a smooth interior.

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

1

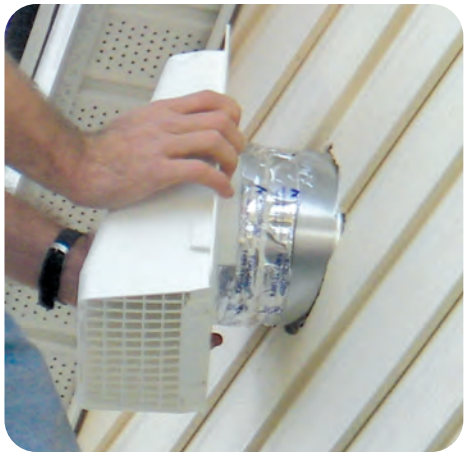
Weatherization Works

18-1 INSTALL EXHAUST FAN FLEX DUCT (BATH FAN ONLY)

Aligns with SWS 6.0101.1, 6.0101.2, 6.0201.1

BEFORE

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



AFTER

✓ Bath 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.

Weatherization Works

18-1 INSTALL EXHAUST FAN FLEX DUCT (BATH FAN ONLY)

1. Ensure proper connection of duct to bath 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 the duct

NOTES

See ASHRAE 62.2-2016 regulations regarding ductwork requirements about air sealing, being as straight as possible, being supported, and being insulated will apply to exhaust fans. When applicable, pitch duct to remove condensation to outdoors. Duct diameter will be equal to or greater than the exhaust fan outlet.

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

Weatherization Works

18-2 INSTALL A HARD-DUCTED EXHAUST VENT

Aligns with SWS 6.0101.1, 6.0101.2, 6.0201.1, 6.0201.2

BEFORE

✗ Kitchens and bathrooms must be ventilated to control moisture, vapor, and combustion gases

TOOLS

- Measuring Tape
- Hole Saw
- Drill
- Caulk Gun

AFTER

KITCHEN CHECKLIST

✓ Located within 5 feet of primary cooking surface

✓ At least 100 cfm but not more than 3 sones

✓ Efficacy of 2.8 cfm/watt or more

BATHROOM CHECKLIST

✓ Located in center of room

✓ At least 50 cfm but not more than 2 sones

✓ Efficacy of 4 cfm/watt or more

NOTE - The above specifications are for spot ventilation only. Follow ASHRAE specifications for continuous.

MATERIALS

- Mastic
- Brush
- Foil Tape
- Duct Insulation
- 28-Gauge Ducting
- Vent Termination
- Caulk

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.

Weatherization Works

18-2 INSTALL A HARD-DUCTED 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

NOTES

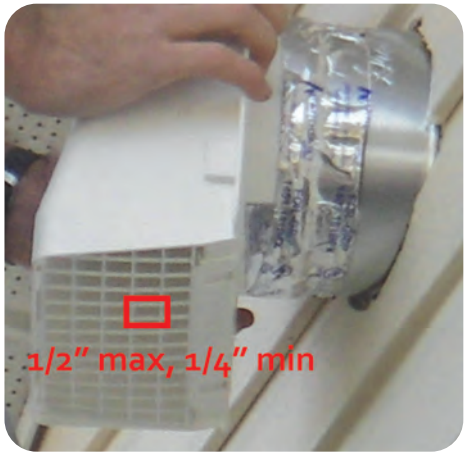
4. Completely seal joints

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

Weatherization Works

18-2 INSTALL A HARD-DUCTED EXHAUST VENT

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



6. Chose 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.

Weatherization Works

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
- ✓ Ensure ducts are properly 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 (for temporary use)
- Flexible Caulking
- Butyl Tape

NOTES

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

PPE

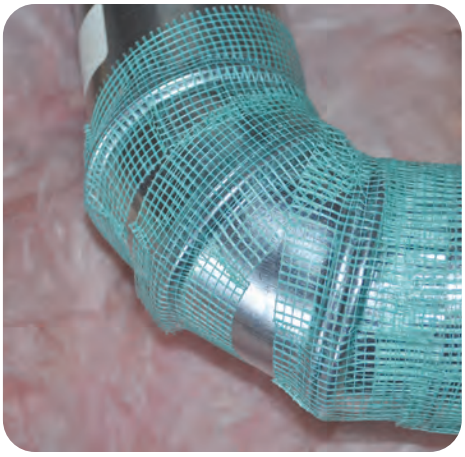
** location dependent **weather dependent*

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

Weatherization Works

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.

Weatherization Works

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 one additional step

B-2. Apply temporary 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 inch past edges of tape in all directions

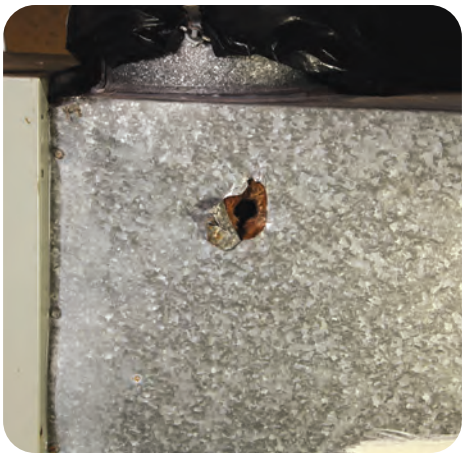
NOTES

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

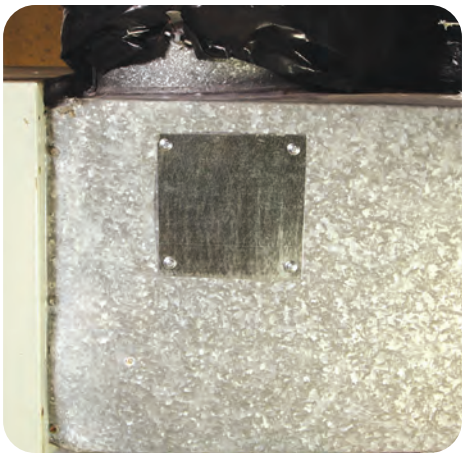
Weatherization Works

19-1 SEAL DUCTS WITH MASTIC

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

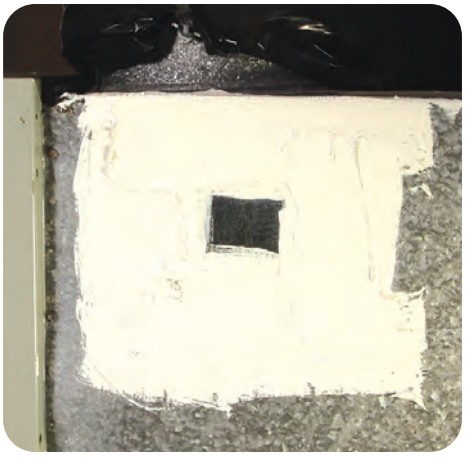


C-1. Larger holes require a different process



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 inch 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.

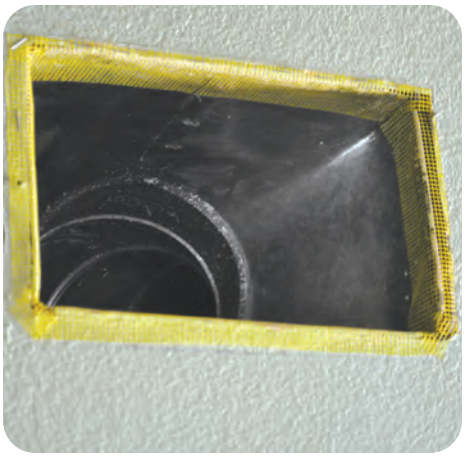
Weatherization Works

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

Weatherization Works

19-1 SEAL DUCTS WITH MASTIC

METHOD E – AT THE AIR HANDLER

E-1. Ensure that filter slot cover is removable so that 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 foil tape on new installs

NOTES

NEW FURNACE INSTALLATION NOTES-

1. Install thermostat where it accurately reflects the temperature and humidity of the zone which it controls
2. Seal penetrations for control wiring with a durable sealant that complies with applicable fire safety code
3. Provide occupants/ owners with user's manual, warranty information, installation instructions and installer contact information.
4. Install a filter slot cover.
5. See A-5 Condensate

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

1

Weatherization Works

20-1 INSULATE HARD PIPE DUCTS

Aligns with SWS 5.0107.1, 5.0105.2, (6.0202.1)

BEFORE YOU BEGIN

VERIFY DUCTS ARE:

- ✓ Mechanically fastened
- ✓ Supported with 1.5 inch wide or greater material, installed every 4 feet or less, without crimping or pinching the ductwork
- ✓ Air-sealed properly

AFTER

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

PPE

** location dependent **weather dependent*

TOOLS

- Measuring Tape
- Utility Knife

MATERIALS

- Duct Insulation (min R-8) with Exterior Vapor Retarder
- UL-181 Tape
- Twine
- Zip Ties

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

Weatherization Works

20-1 INSULATE HARD PIPE 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. Insulation will not be 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 need not to cause compression on the insulation

NOTES

Ductwork will be sealed before being insulated. Sealing and insulating ductwork is considered a general heat waste measure and should be performed whenever the ductwork is outside of the conditioned volume of the home. Ductwork is generally, not insulated inside conditioned volume.

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

Weatherization Works

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.

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.

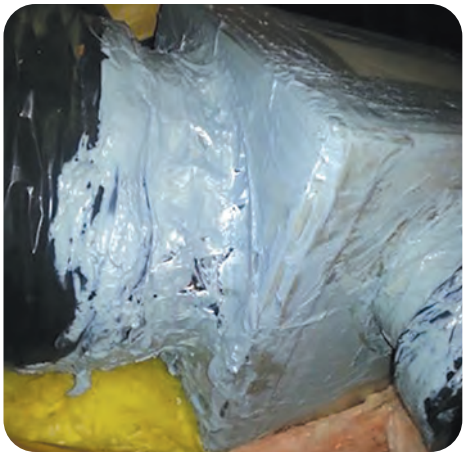
Weatherization Works

20-2 INSULATE FLEX DUCTS

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

2. Pull insulation over hard connections as needed

3. Secure vapor retarder layer at boots



4. Seal new joints

NOTES

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

1

Weatherization Works

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 Fiberglass Mesh Tape

PPE

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

Weatherization Works

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

NOTES

- R-8 minimum for ducts in unconditioned spaces.

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

Weatherization Works

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
- R-board
- Gypsum Board
- Mastic
- UL-181 Mesh Tape
- Tape

PPE

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

Weatherization Works

20-4 INSULATE PLENUM

1. Cover any unnecessary holes in the air handler cabinet

2. Check return cavities inside building envelope to ensure they are sealed off from unconditioned spaces

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

NOTES

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

4. Prepare plenum by removing any residue from old insulation

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

Weatherization Works

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.

Weatherization Works

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 overlapping flap securely adhesed 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

NOTES

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

1

Weatherization Works

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 will flow away from window

NOTES

Check file for age of house and follow all KDHE requirements if the original date of construction was pre-1978. Paint /seal new surfaces to prevent moisture intrusion.

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.

Weatherization Works

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. Replace flashing as needed

5. Dry fit window

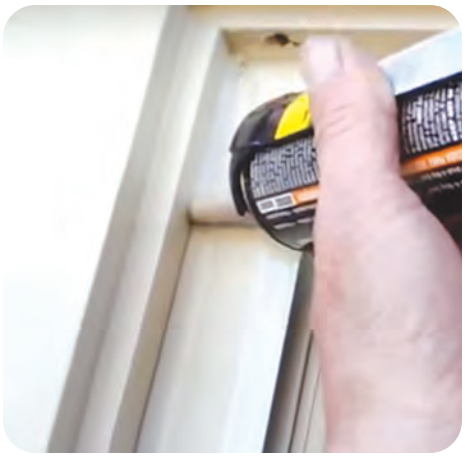
6. Level the window using shims and secure with mechanical fasteners

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

Weatherization Works

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

NOTES

Paint / seal new surfaces to prevent moisture intrusion.

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

1

Weatherization Works

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

NOTES

Check file for age of house and follow all KDHE requirements if the original date of construction was pre-1978. Paint /seal new surfaces to prevent moisture intrusion.

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.

Weatherization Works

21-2 DOOR INSTALLATION

1. Remove old door and clear away debris

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

3. Prepare opening by ensuring that 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, locate 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.

Weatherization Works

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 both air and water intrusion

10. Replace trim

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

NOTES

Paint/seal all surfaces to prevent moisture intrusion.

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

Weatherization Works

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
- Push points

NOTES

Check file for age of house and follow all KDHE requirements if the original date of construction was pre-1978. Paint /seal new surfaces to prevent moisture intrusion.

PPE

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

Weatherization Works

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 inches less than RO

NOTES

4. Run interior bead of caulk

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

Weatherization Works

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 push points

7. Glaze all edges

NOTES

Adjust existing sash lock or install a new sash lock so that the rails of the upper and lower sashes are flush and in full contact and no gaps are visible between the sash(es)

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

Weatherization Works

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.

Weatherization Works

23-1 INSULATE AN ELECTRIC DOMESTIC WATER HEATER

1. Insulate tank with minimum R-11 or better

2. Ensure a continuous vapor barrier with no gaps

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

4. Tape all seams and edges airtight

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

Weatherization Works

23-2 INSULATE A GAS 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.

Weatherization Works

23-2 INSULATE A GAS DOMESTIC WATER HEATER

1. Insulate tank with minimum R-11 or better

2. Ensure a continuous vapor barrier with no gaps

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

NOTES

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

Weatherization Works

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.

1

Weatherization Works

23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES

Aligns with SWS 7.0301.1

Insulate pipes to a minimum R-3 at least 6 feet from DHW on both hot and cold lines

Insulation should be continuous with no gaps

TOOLS

- Utility Knife
- Measuring Tape

MATERIALS

- Pipe Insulation
- Tape or Tie Straps

PPE

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

Weatherization Works

23-3 INSULATE DOMESTIC HOT WATER (DHW) PIPES

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

Do not rely on manufactured adhesive seam seal to hold closed

Secure seams with 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.

Weatherization Works

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.

Weatherization Works

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. Then use pipe wrench or channel locks to loosen connection at shower arm

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

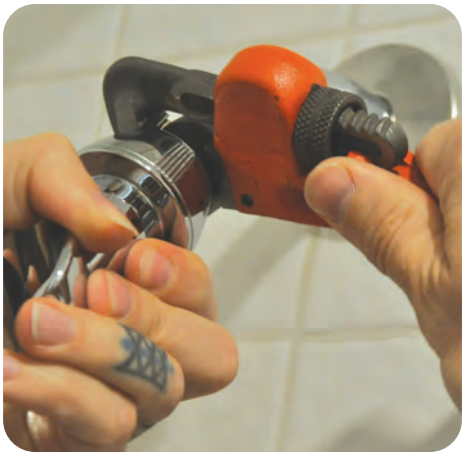
5. Wrap new thread tape around threads

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.

Weatherization Works

24-1 INSTALL A LOW-FLOW SHOWERHEAD



7. Ensure that 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

NOTES

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

Weatherization Works

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

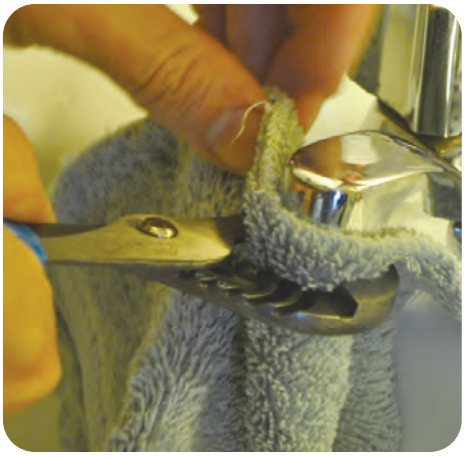
- Thread Tape
- WaterSense Aerator

PPE

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

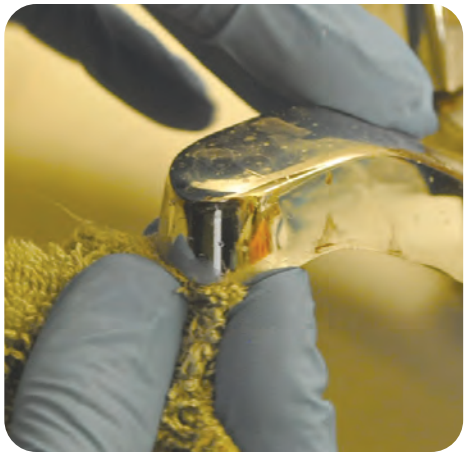
Weatherization Works

24-2 INSTALL A LOW-FLOW FAUCET AERATOR



1. Using adjustable wrench or aerator wrench, gently remove old aerator, taking care not to damage faucet

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

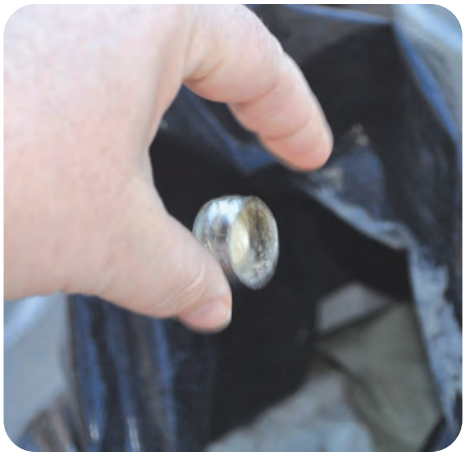
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

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

NOTES

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

Weatherization Works

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*

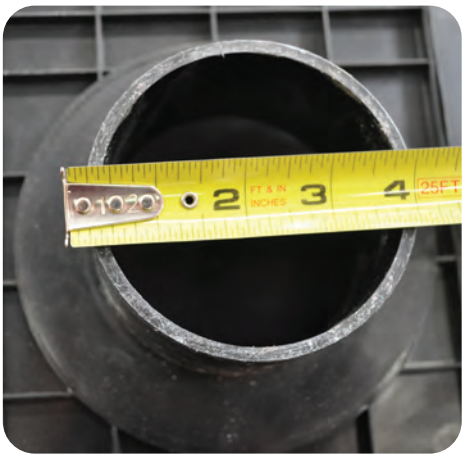
Tools and materials listed are only recommendations and may not include everything needed to complete the job.

Weatherization Works

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.

Weatherization Works

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 in order 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.

1

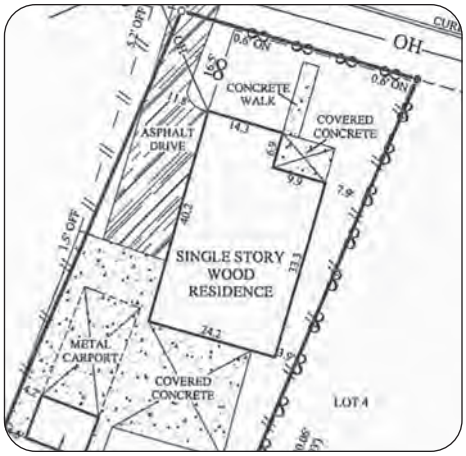
Weatherization Works

25-2 LOCATE AN EXTERIOR TERMINATION

Aligns with SWS 6.0101.2

CHECKLIST

✓ Locate all exhaust terminations to the outside – not attics and crawlspaces – and:



✓ At least 3 feet from the property line

✓ At least 3 feet from all operable openings

✓ At least 10 feet from a mechanical intake

✓ If near soffit, no open soffit venting for at least 6 feet on each side

NOTES

See these Job Aids for PPE 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

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.

2020 SWS	Detail Title	Job Aids
2.0101.1	Hardwired (interconnected) Smoke Alarms	A-2
2.0101.2	Battery-Operated Smoke Alarms	A-2
2.0102.1	CO Detection and Warning Equipment	A-2
2.0202.1	Un-Vented Subspaces – Ground Cover	16-1, 16-2
2.0202.2	Vented Subspaces – Ground Cover	16-1, 16-2
2.0202.3	Pier and Skirting Foundations – Ground Cover	16-1, 16-2
2.0401.2	Sump Well/Pit Covers	A-4
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
3.0201.9	Window Replacement	21-1
3.0202.1	Door Air Sealing	11-1, 11-2
3.0202.2	Door Replacement	21-2
4.0103.1	Accessible Attic – Batt Installation	4-1
4.0103.2	Accessible Attic – Loose Fill Installation	4-1, 6-1
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
4.0103.12	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

2020 SWS	Detail Title	Job Aids
4.0104.6	Knee Wall – SPF with Existing 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
4.0301.1	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
4.0302.3	Dense Pack with Rigid Barrier	14-2
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 – Non-Foam Insulation (Walls)	(12-4)
4.0402.2	Closed Crawlspace – Rigid Foam Insulation	12-4
4.0402.4	Basements – without Groundwater Leakage	12-3
4.0402.5	Basements – with Groundwater Leakage	12-3
5.0102.1	Condensate Removal	A-4
5.0105.1	Mechanical Fastening (Forced Air Duct Repair)	(19-1)
5.0105.2	Duct Support	20-2, (19-1)
5.0105.3	Crossover Duct Repair or Replacement	(19-1)
5.0106.1	General Duct Sealing (Forced Air)	19-1
5.0107.1	General Duct Insulation	20-1, 20-2, 20-3, 20-4
5.0107.2	Duct Insulation – SPF	20-1, 20-3
5.0503.1	Chimney Liners	A-4
6.0101.1	Ventilation Ducts	18-1, 18-2
6.0101.2	Exhaust Terminations	18-1, 18-2, 19-1, 25-1
6.0101.3	Exterior Intakes	19-1
6.0201.1	Surface Mounted (Local Ventilation Exhaust Systems)	2-6, 18-2, 25-1
6.0201.2	Kitchen Range Hoods	2-6, 18-2, 25-1
6.0202.1	Clothes Dryer (Appliance Exhaust)	17-1, (20-1)
7.0103.1	Lighting Replacement	A-3
7.0103.2	Lighting Reduction	A-3
7.0103.3	Ballast Replacement	A-3
7.0103.4	Exit Sign Replacement	A-3
7.0103.5	Emergency Lighting Replacement	A-3
7.0103.6	Security Lighting	A-3

2020 SWS	Detail Title	Job Aids
7.0103.7	Daylighting	A-3
7.0104.1	Occupancy Sensors	A-3
7.0104.2	Stand-Alone Timers	A-3
7.0104.3	Motion Control Sensors	A-3
7.0104.4	Outdoor Photo Sensors	A-3
7.0104.5	Bi-Level Controls	A-3
7.0201.1	Low-Flow 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://necaonline.com

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

SPF: Spray Polyurethane Foam, also known as 2-part spray foam, is a liquid insulation material that combines an iso and a resin and requires very particular personal protective equipment

SWS: Standard Work Specification, https://sws.nrel.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,

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

- 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 less than 4 inches and not more than 12 inches away from the ceiling (to the top of the alarm) or on the ceiling
- At least 10 feet from any cooking appliance
- Away from windows, doors, or ducts where drafts might interfere with their operation
- For pitched ceilings, install alarm within 3 feet of the peak, but not in the apex (within four inches 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 720

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

- On every level of the home, including the basement
- More than 15 feet from heating or cooking appliances
- NOT in or near very humid areas, such as bathrooms

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 Measures

FOR ALL BASELOAD 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., EPA Section 608 of Clean Air Act of 1990)

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 a 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.

FOR ALL REFRIGERATOR REPLACEMENTS:

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

Permanently remove old appliance from job site and recycle or dispose of removed equipment and refrigerant in accordance with local and federal law (e.g., EPA Section 608 of Clean Air Act of 1990)

Permanently decommission old equipment

REFRIGERATOR REPLACEMENT

Select an ENERGY STAR® qualified appliance

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

All refrigerators in the household will be inspected and have model numbers and other necessary information recorded on the inspection form. All refrigerators in the home will be modeled in the REM energy audit with corresponding energy usage. Refrigerators are eligible upgrade items and should be proposed on the Improvement Analysis, unless rejected by the client. Multiple units per home are eligible. Replacements should be of like model, size, configuration, and features (top mount, side by side, ice maker, etc.). Client education will be provided to encourage the removal of unnecessary or infrequently used secondary units.

A-4 Specialized Field-Work Tasks

Install a Condensate Drain

Aligns with 5.0102.1

Convey all condensate from all cooling coils, condensing furnaces, etc. to the exterior of the building, along condensate piping with not less than 1/8" per foot (1% slope) toward the termination point. Install condensate drain pumps when condensate cannot be drained by gravity.

Seal all piping that conveys condensate

Install vents and traps on condensate drain lines in accordance with manufacturer specifications and applicable building code and in a manner that allows for cleaning of condensate lines without cutting the existing pipe

Install a secondary drain pan under all condensing appliances installed in or above conditioned space and where water damage may occur to the structure

Install an independent condensate drain for the secondary drain pan that drains to a visible termination location

Slope drain pan towards the condensate drain

Install a float switch in the primary and secondary drain pan that is interlocked with the system power circuit and will break the circuit when drainage fails to remove condensate

When there is potential for condensation or freezing of the drain line, insulate condensate drain lines to a minimum of R-4 with insulation that contains a Class II or greater vapor retarder (Note - R-4 foam pipe insulation measures approximately 5/8 " thick)
If termination of condensate drain is to the outdoors, direct it downward with an elbow fitting at the end of the exterior termination.

Install a Chimney Liner

Aligns with 5.0503.1

Select and install chimney liners in accordance with applicable code (i.e., NFPA 54, NFPA 31, IFGC) and manufacturer specifications. If conflict exists between code and manufacturer specifications, apply the more restrictive requirement

Kansas State Technical Standards state the following:

Flue liners will be galvanized steel vent pipe, stainless steel pipe, Type-B vent, or a flexible metal liner and size appropriately. A liner used to vent solid fuel may not also be used to vent liquid or gaseous fuel.

Chimney Liner Installation Step-by-Step:

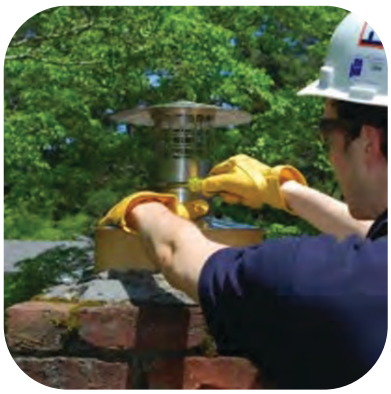
1. Measure from the bottom termination to the chimney crown. Add one foot to the measurement and cut the liner to length.

2. Pull chimney liner into position (from top or bottom, whichever is easier) with a rope or pulling cone.

3. Measure and mark the flexible chimney liner at 4 inches above the chimney.

4. Cut the flexible chimney liner to length.

5. Install top plate over opening and attach it to the liner.



6. Fasten the rain cap to the chimney liner.

7. Seal around penetrations in chimney with refractory (furnace) cement.

8. Connect appliance vent to the chimney liner.

9. Use refractory (furnace) cement to seal metal water heater or furnace vents to masonry chimney.

Install a Sump Cover

Aligns with 2.0401.2

Cover sump pump wells or pits with an airtight cover that allows all necessary penetrations to be sealed tightly

Install sump pump covers to allow bulk moisture to drain from above the cover utilizing trapped or one-way ball valve fittings, or equivalent

Two examples of acceptable sump covers:

A-5 GENERAL AIR SEALING

SEALANT SELECTION
Select sealants that:
are compatible with their intended surfaces,
allow for differential expansion and contraction between dissimilar materials,
meet the requirements of the applicable fire safety code (e.g. thermal or ignition barriers), and
for use inside the pressure boundary select low volatile organic compound (VOC) sealants that meet independent testing and verification protocols

MATERIAL SELECTION
Select materials that:
adequately support applied load and are permanent air barriers,
meet the requirements of the applicable fire safety code (e.g. thermal or ignition barriers), and
for use inside the pressure boundary select low volatile organic compound (VOC) materials that meet independent testing and verification protocols

BACKING, INFILL, and SUPPORT
If backing or infill is installed, it will not bend, sag, or move once installed, and will adequately support any insulation installed on the surface
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
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)
Support material installed for any walking/working surface (attics or floors) will support the weight of a worker and any insulation applied in the area
Mechanically fasten backing or infill materials sufficient to prevent movement

SURFACE PREPARATION
Remove any material from the sealing area that will prevent full adhesion of the selected sealant

SEALANT SELECTION
Apply a continuous seal at all seams, cracks, joints, edges, penetrations, and connections in sealing surface while applying sufficient pressure to push sealant into any gaps or cracks and contact any backing or infill material required

HIGH-TEMPERATURE APPLICATION
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.).

A-6 STORM WINDOWS

SURFACE PREPARATION
Remove any material from the sealing area that will prevent full adhesion of the selected sealant. Remove any material from the installation area that will prevent a tight seal.

INSTALLATION
Install new storm window in compliance with the manufacturer's instructions. Installation must be substantially airtight when closed.

SEALING
Apply a continuous bead of sealant under the top and side flanges of frame before installation. Do not seal the lower flange or designed drainage openings (i.e., weep holes).

SAFETY
Verify safe operation and size of egress windows as required by local codes. Do not install fixed storm windows in required egress locations.

A-7 DUCT REPAIR

NOTE- All repair connections must be sealed with UL 181 mastic

METAL TO METAL
Fasten ducts with a minimum of three equally spaced galvanized or stainless steel mechanical fasteners.

FLEX TO METAL
Fasten ducts with UL 181 approved tie bands using a tie band tensioning tool.

FLEX TO FLEX
Install a rigid metal coupling of the same size as the flex duct between the two sections. Fasten both joints with UL 181 approved tie bands using a tie band tensioning tool.

DUCT BOARD TO DUCT BOARD

Cut duct board edges to create an overlapping joint on all contact surfaces. Fasten joints with outward clinching (stitch) staples spaced every 2". Cover joint with UL 181 rated mastic embedded fiber tape and additional mastic that laps at least 1" past the edges of the tape on all sides.

DUCT BOARD TO FLEXIBLE DUCT

Install a metal take-off collar on the duct board specifically designed for the thickness of the duct board.

Bend all finger tabs down securely so collar shank is firmly seated against the exterior surface.

Attach flexible duct to collar with UL 181 approved tie bands using a tie band tensioning tool.

DUCT BOARD TO METAL

Fasten duct board to metal duct using metal channel and mechanical fasteners spaced evenly on all sides.

Cover connection joint with UL 181 rated mastic embedded fiber tape and additional mastic that laps at least 1" past the edges of the tape on all sides.

DUCT BOARD PLENUM TO AIR HANDLER CABINET

Fasten duct board to air handler cabinet using metal channel fastened with screws spaced a maximum of 6" with the duct board sandwiched between the channel flanges.

In upflow air handler connections, install a flexible connection between supply plenum and unit that does not reduce the inside dimensions of the duct.

DUCT BOOT TO SUBFLOOR
Fasten boot to wood using a minimum of 1 stainless steel or galvanized fastener per side.

DUCT BOOT TO GYPSUM
If accessible, fasten a boot hanger to adjacent framing with mechanical fasteners.
Connect boot to hanger with mechanical fasteners.
If inaccessible, fasten boot to gypsum with UL 181 rated fiber tape and mastic.

METAL PLENUM TO AIR HANDLER CABINET
Install a flexible connection between plenum and unit that does not reduce the inside dimensions of the duct.
Fasten plenum on all sides with mechanical fasteners spaces no more than every 6".

A-8 Refrigerant Lines

MATERIAL SELECTION
Select only manufacturer and code approved (e.g., IRC, IMC) refrigerant lines, fittings, etc.

SIZING
Size refrigerant lines in accordance with manufacturer specifications for the installed equipment.

INSTALLATION
Install refrigerant lines without kinks, crimps, or excessive bends.
Route lines in a manner that protects it from damage by workers and occupants.
Join lines using manufacturer-approved method(s).
Install proper filter dryer(s) on all systems.
Install P-traps on suction line risers that are greater than 10' in height.
Use manufacturer specifications to determine appropriate lengths and elevations of refrigerant lines between condensing units and indoor coils.

INSULATION
Insulate all suction lines to a minimum of R-4 with an insulation that is a class II or better vapor retarder.
Insulate all high pressure lines that pass through spaces where condensation may occur to a minimum of R-4 with an insulation that is a class II or better vapor retarder.
Seal all seams, joints, etc. of insulation using compatible material (e.g., tape).
Install UV-resistant insulation on exterior lines or protected insulation from UV degradation.

SUPPORT
Secure and support refrigerant lines according to applicable code and in a manner that protects the line from damage by workers or occupants.

PROTECTION
If refrigerant lines are installed where they may be contacted by vehicles, people, tree limbs, etc., install a rigid sleeve or pipe duct over them that provides adequate impact protection.

REFRIGERANT CAPS
Install locking refrigerant caps on all refrigerant access ports.

A-9 Sealing Dropped Ceilings

SEALANT SELECTION
Select sealants that:
are compatible with their intended surfaces,
allow for differential expansion and contraction between dissimilar materials, meet the requirements of the applicable fire safety code (e.g. thermal or ignition barriers), and for use inside the pressure boundary select low volatile organic compound (VOC) sealants that meet independent testing and verification protocols

MATERIAL SELECTION
Select materials that:
adequately support applied load and are permanent air barriers,
meet the requirements of the applicable fire safety code (e.g. thermal or ignition barriers), and for use inside the pressure boundary select low volatile organic compound (VOC) materials that meet independent testing and verification protocols

SUPPORT
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).
Support material installed for any walking/working surface (attics or floors) will support the weight of a worker and any insulation applied in the area.

SUPPORT PREPARATION
Remove any material from the sealing area that will prevent full adhesion of the selected sealant

INSTALL AIR BARRIER
Install a permanent air barrier either above or below the existing ceiling material that will structurally support the final insulation level. Gypsum board recommended.

SEALANT APPLICATION
Apply a continuous seal at all seams, cracks, joints, edges, penetrations, and connections of the pressure boundary while applying sufficient pressure to push sealant into any gaps or cracks and contact any backing or infill material required

HIGH-TEMPERATURE APPLICATION
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.)

A-10 UNCONDITIONED ATTIC VENTILATION

PRE-WORK QUALIFICATIONS
Verify the presence of an effective air barrier and thermal boundary between the attic and living space.

VENT SELECTION
Attic vent types will be consistent with requirements for their specific location (e.g., exterior soffit, gable end, roof) and material and intended use (e.g., metal vent on metal roof).
Install only passive ventilation, no powered ventilators may be installed.

VENT LOCATION
Install between 40 and 50 percent of attic ventilation within 3 feet of the highest point in the ventilated space.
Install attic vents in locations that prevent entry of wind-driven precipitation.

VENTILATION SCREENS
All attic ventilation sources with holes greater than 1/4" will have corrosion-resistant wire mesh screens installed with openings of 1/16" to 1/4".
Existing vents that are not screened will be covered with corrosion-resistant wire mesh with openings of 1/16" to 1/4".

VENTILATION BAFFLES
If soffit venting is installed, mechanically fasten baffles (i.e., soffit chutes) in each truss bay that terminate at least 6" above final insulation level and provide a minimum of 2" clearance between insulation and roof deck material.

GUIDANCE ON ATTIC VENTILATION - Many of the homes weatherization will encounter will have inadequate attic ventilation. The requirement for attic ventilation is a building code requirement and inadequate attic ventilation would be considered an existing code compliance issue. Weatherization has no requirement and is not equipped to correct existing code compliance issues. However, if and where the local code is triggered and requires code compliance because of a weatherization activity, weatherization will install attic ventilation to become code compliant. When the roof venting requirement is triggered agencies shall document in the client file the actual code that was triggered and what weatherization activity triggered the code/permit.

A-11 FUEL-FIRED STORAGE TANK WATER HEATER (NEW INSTALLS ONLY)

EQUIPMENT SELECTION (Waiver granted)
Select a system that:
is energy factor (EF) rated at 0.58 or better, fits in the installation space with required clearances, and provides sufficient hot water for the home and occupants.

EQUIPMENT ACCESSIBILITY
Provide a level working space not less than 30" in length and 30" in width in front of the control side of the appliance.
Install appliance and plumbing to allow for inspection, maintenance, and replacement of the appliance and its components, without disturbing other installed equipment, controls, piping, and components, other than what requires repair/replacement. Ensure that anode rod is accessible for replacement.

EMERGENCY DRAIN PAN
If appliance is installed in or above conditioned space or in a location where water damage could occur, install a drain pan according to the requirements of the IRC. Drain pan to the exterior of the building.

SHUT-OFF VALVES
Install a separate water cut-off valve for both the hot and cold water lines to allow for isolation of the tank.

EXPANSION TANK
Install an expansion tank anytime a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer. Connect the tank to the cold water supply line at a point that is downstream of all check valves, pressure reducing valves and backflow preventers.
Size thermal expansion tanks in accordance with the tank manufacturer's instructions and applicable code (e.g., IRC, IBC).

DIELECTRIC UNIONS
Install dielectric unions when connecting copper to galvanized steel piping in accordance with the IRC and manufacturer specifications.

HEAT TRAPS
Install heat traps on the inlet and outlet piping where not provided by manufacturer.

DISPOSAL
Permanently remove equipment from job site and recycle or dispose of removed equipment and refrigerant in accordance with local and federal law (e.g., EPA Section 608 of Clean Air Act of 1990).