Alaska Housing
FINANCE CORPORATION

Alaska

Weatherization Assistance
Program

Standard Work Specifications

Field Guide

2025 Revision

Weatherization
Works

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Alaska Field Guide

Produced for Alaska Housing Finance Corp
in collaboration with Alaska Community Development Corp

Written by and edited by Daniel Berube and Mimi Burbage

Produced and printed in Anchorage, AK, USA

Cover photo Dan Berube, Location Homer, AK

Acknowledgements

Thanks to Amanda Hatherly and staff of New Mexico Energy$mart Academy, Santa Fe Community College for providing original document.

Special thanks to the Opportunity Council Building Performance Center for technical support and to the Energy Outwest membership in the development of the Alaska Field Guide.

Thanks to the staff of AHFC for their patience and support.
Special thanks to Wendy Perez for her editing.

The DOE subgrantees Alaska CDC, RuralCAP and Interior Weatherization for their time devoted to the review process and the devoted work of applying the standards in the field.

It is really the workers in the field that makes WAP so successful.

Appreciation for the support and understanding of DOE headquarters in regard to this project.

Big credit to Caleb Simon of SMS for his thorough and complete review of the Field Guide. It was a simple, easy process to work with him.

Lastly we are grateful for all the champions in the energy retrofit network that have spent their careers understanding building science and applying best practice to create a more efficient, safe, healthy and comfortable living environment.

This manual is a work in progress, every attempt has been made to stay current and utilize best practice in relation to the SWS and the intent of the WAP.

Co-edited in a collaboration by Dan Berube and Mimi Burbage
Anchorage, Alaska

Table of Contents

INSULATION SECTION (continued)

Introduction 2025 revision of AK Field Guide

January 10,2025

This is the latest version of the DOE Weatherization Assistance Program (WAP) Installation Field Guide for Alaska.

It was generated from the Standards Work Specifications developed by NREL.

The Standard Work Specifications (SWS) define the minimum acceptable outcomes for home energy upgrades installed on single-family, multifamily, and manufactured housing.

These specifications provide objective based outcome requirements for installed energy efficiency measures.

The Field Guide intent is to assist the installer in meeting the standards set by DOE WAP for measures applied in the field.

Using this guide

- This guide is available in an electronic and printed version
- The PDF version is hyperlinked to the specification on the NREL SWS Site
  (Click on the blue title or spec number of individual sheet).
- Complete set of SWS on website
- Individual sheets of the pdf version can be printed and included in a work order
- Guide organized by categories:
  - Health and Safety
  - Airsealing
  - Insulating
  - Heating and Cooling
  - Ventilation
  - Baseload (now includes consumption of energy that is not related to thermal, so not just electrical)
  - Manufactured Home

NOTES

The Field Guide is an attempt to contain a set of working specs with some install instructions as pertinent to Alaska climate and conditions.
It is not the complete set of SWS.
Missing or more complete specifications can be found on the sws website. Local code, if more stringent, will supersede SWS .
Always follow manufacturer installation instructions and local codes.

Update and Changes to 2025 Edition

4 additional sheets for new standards

-0.0501.1 Photovoltaic solar
-0.0101.1 LED Retrofits Non ICU
-0.0201.1 Wood or Pellet Stove Installation
-4.0201.2 Exterior EPS Retrofit Wall System

Applicable Redline changes incorporated

3.0201.1 deleted "egress" wording, left diagram of requirement in Alaska

7.0301.2 insulation distance from flue

7.0302.2b Equipment selection eliminate "energy star"

Inserted "Select efficient, durable, and properly sized water heater"

Documentation

Owner's manuals for equipment installation

Desired Outcome

Safe, compliant, efficient, and effective system installation in which sequence of operation is correct

Specification

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

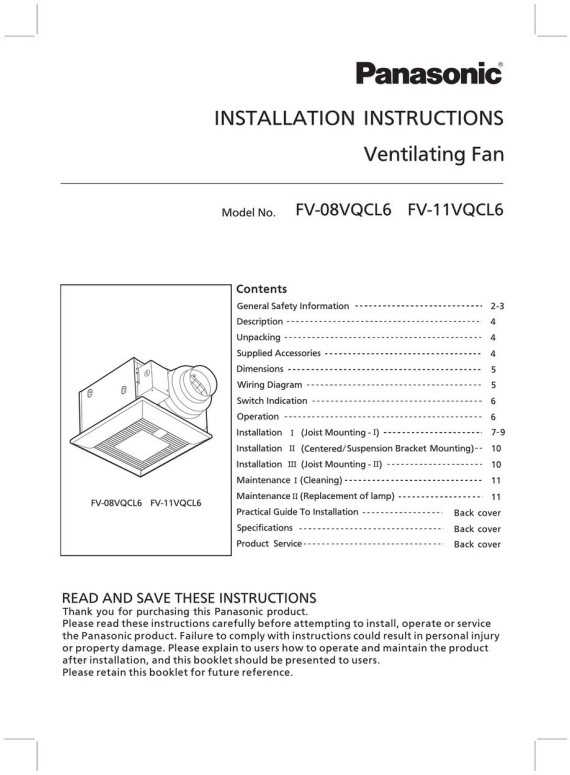
NOTE: In nearly every instance where new equipment is installed, whether it is a smoke alarm, ventilation fan, HVAC system, etc., the installer is required to leave the client with the installation manual and pertinent instructions.

Examples of equipment with links:

- Thermostat Replacement 5.0101.1g Documentation
- Domestic Water Heater Replacement 5.0101.1g Documentation
- CO Detector 2.0102.1d Occupant Notification
- Refrigerator Replacement 7.0101.1f Documentation
- Consumer Electronics 7.0102.1f Documentation

Objective

Provide occupants and service technicians with instructions



Panasonic

INSTALLATION INSTRUCTIONS

Ventilating Fan

Model No. FV-08VQCL6 FV-11VQCL6

FV-08VQCL6 FV-11VQCL6

Contents

READ AND SAVE THESE INSTRUCTIONS

Thank you for purchasing this Panasonic product.
Please read these instructions carefully before attempting to install, operate or service the Panasonic product. Failure to comply with instructions could result in personal injury or property damage. Please explain to users how to operate and maintain the product after installation, and this booklet should be presented to users.
Please retain this booklet for future reference.

TOYOSTOVE®

TOYOTOMI

LASER CLEAN HEATING SYSTEM/VENTED HEATER

INSTALLATION AND OPERATION INSTRUCTIONS

LASER CLEAN VENTED

MODEL Laser 30 c UL us

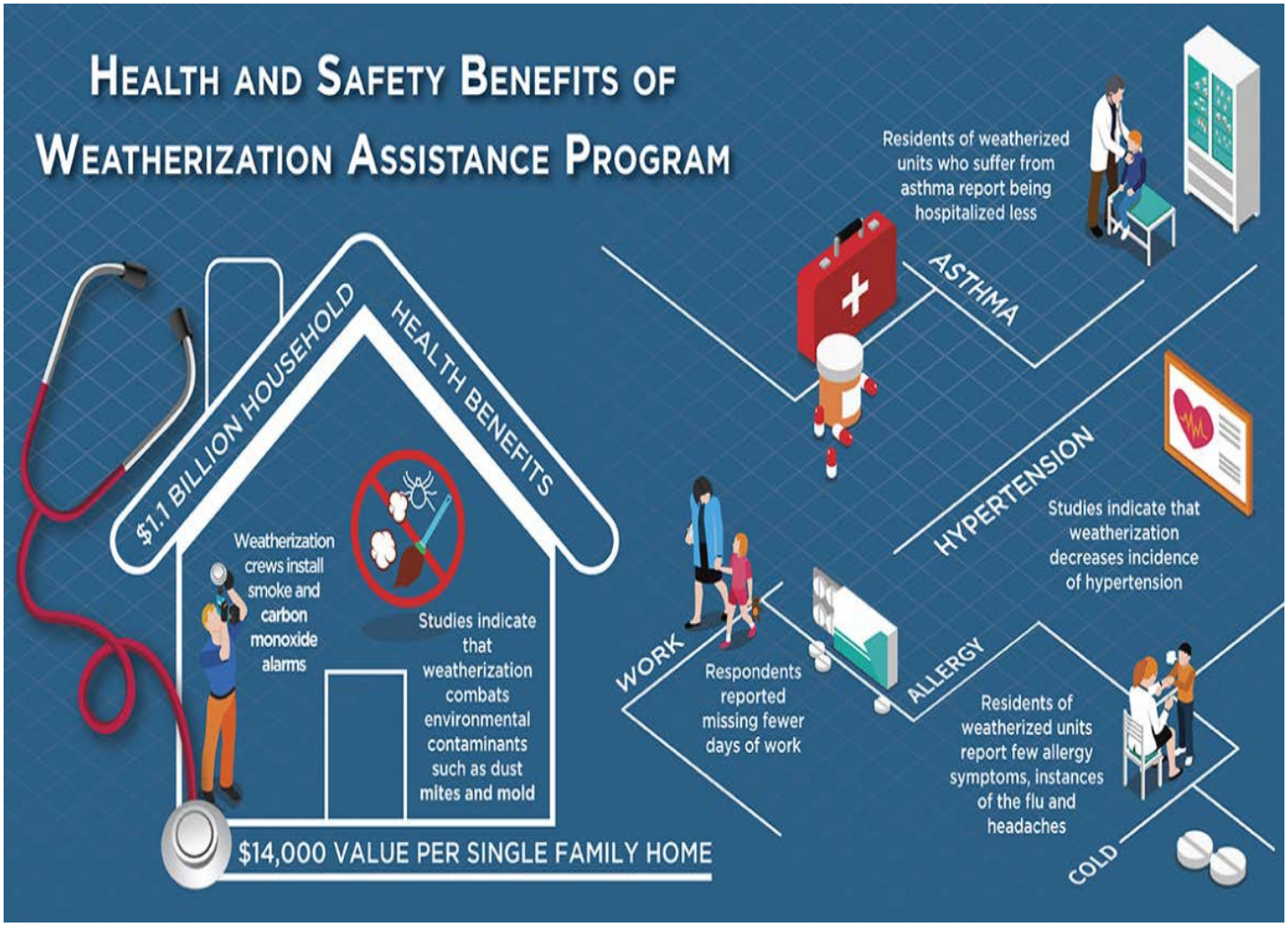
(Type B)

IMPORTANT

READ AND UNDERSTAND INSTRUCTIONS BEFORE INSTALLING OR USING HEATER.
RETAIN INSTRUCTIONS FOR FUTURE REFERENCE. CHECK LOCAL CODES AND ORDINANCES FOR PERMITTED USE.

CONTENTS

Health and Safety Section



Combustion Safety Daily Test Out

Desired Outcome:

Ensure proper drafting of all atmospheric combustion appliances before leaving dwelling at end of day.

Specification:

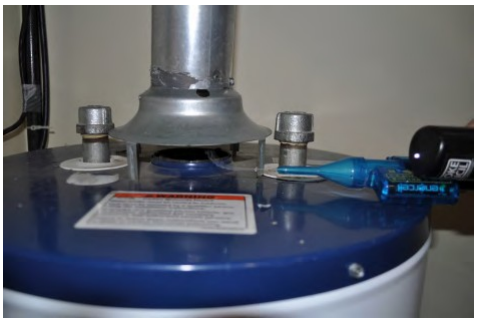
At the conclusion of each work day in which envelope air sealing, duct sealing or exhaust ventilation measures have been performed; depressurization and spillage testing will be performed on atmospheric drafted appliances.

Objective:

Ensure work completed in dwelling has not adversely affected the operation of combustion appliances.

Run depressurization test at the end of the work day on atmospheric vented appliances

Complete spillage testing on all atmospheric combustion appliances



Assure draft using a smoke pencil, mirror, or lighter,

Test for spillage on all sides of draft diverter

Alaska Variance-daily test out only necessary when work being performed could effect a combustion appliance.

Refer to: AK Daily In-Progress Combustion Safety Test Form

Smoke Alarm (Battery-Operated)

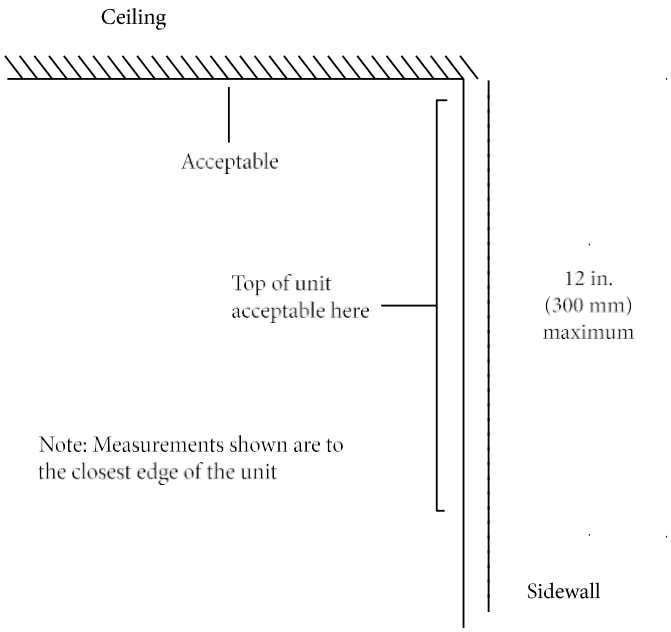
Specification:

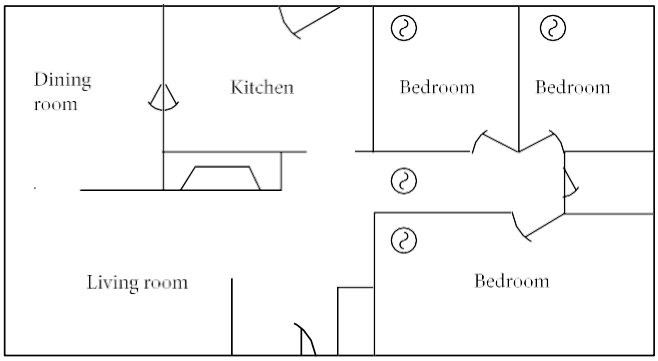
Battery operated alarms will be installed in accordance with the 2012 IRC, NFPA 72 and manufacturer specifications

Alarm Placement

Smoke alarms should be installed according to NFPA 72 and the manufacturer's instructions. Heat and smoke rise, so smoke alarms should be installed on the ceiling or high on a wall to detect the first traces of smoke.

If a room has a pitched (slanted) ceiling, mount the unit near the ceiling's highest point, 4 to 12 inches (10 to 30.5 centimeters) away from the wall. If the room has an A-frame ceiling, mount the unit at least 4 to 12 inches (10 to 30.5 centimeters) away from the peak.



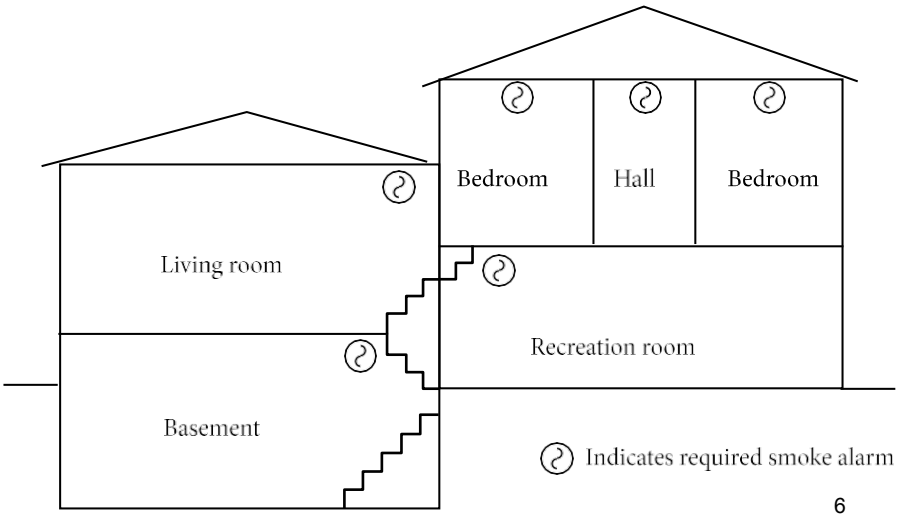


Wall-mounted smoke alarms should be installed so that the top of the alarm is not more than 12 inches (30.5 centimeters) from the ceiling.

Install basement smoke alarms close to the bottom of the stairs. Don't install an alarm at the top of basement stairs; dead air trapped near the closed door could prevent smoke from reaching the unit.

Some household environments can cause nuisance alarms or interfere with a smoke alarm's operation. Avoid placing alarms near a cooking appliance, a dusty area, a shower, or any area where the temperature drops below 40°F (4.5°C) or rises above 110°F (43°C).

Cooking fumes, steam, and automobile exhaust can result in nuisance alarms. Do not install alarms in bathrooms, kitchens, garages, attics, or unheated areas or near recessed ceiling areas, ceiling fans, furnaces, or furnace vents. Place alarms at least 3 feet (0.9 meter) horizontally from bathroom doors.



CO Detectors

Desired Outcome:
Properly installed CO alarms or monitors

Specification(s):
Battery operated CO detection or warning equipment will be installed in accordance with ASHRAE 62.2 and manufacturer specifications as required by the authority having jurisdiction

Battery operated CO alarms should be UL-2034 compliant

Objective: Working CO Detector installed before work begins

Labeling: Installer shall write the date installed or manufacturers recommended replacement date on the device label so it is visible without having to remove the device.

Carbon Monoxide (CO) Detectors: Local agencies shall install a minimum of one carbon monoxide (CO) detector on every floor in every dwelling unit where detectors are not present or are inoperable. Replacement of operable CO detectors is not an allowable cost. CO detectors shall be installed in accordance with manufacturer's requirements.

Detectors shall have:

(1) A 10-year warranty for residential models

(2) Contain internal non-replaceable batteries

(3) An electrochemical sensor.

(4) A digital display that indicates CO levels in Parts Per Million (ppm).

(5) The capability to accurately detect and display low levels of carbon monoxide to 15 ppm.

(6) A label to verify testing and listing to the UL 2034 Standard.

DWH Temperature and Pressure Relief Valve

Desired Outcome:
Safe, reliable, and efficient operation of the appliance maintained

Specification(s):
Correct temperature and pressure relief valve will be installed in compliance with P2803 of the 2012 IRC and according to manufacturer specifications

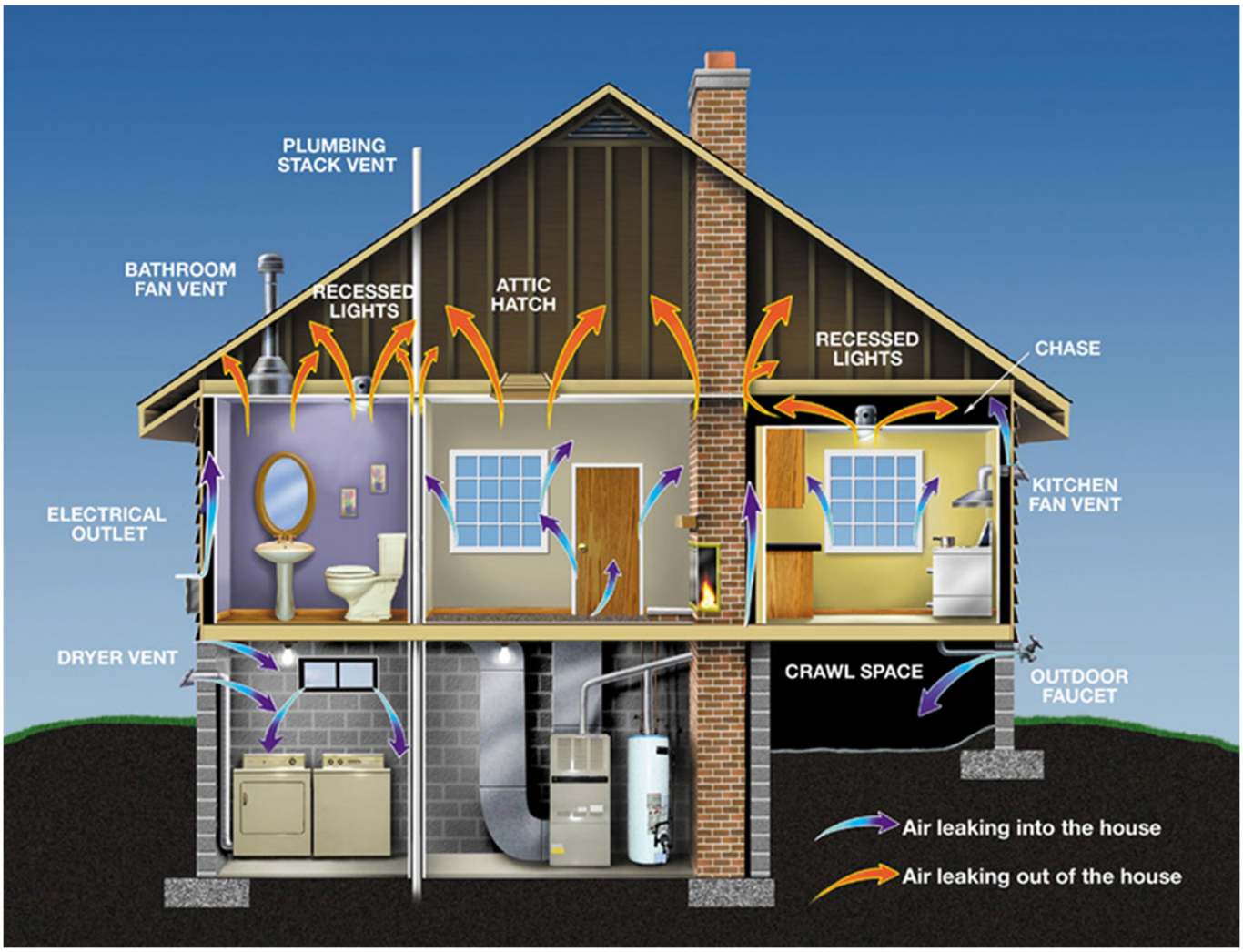
Temperature and pressure relief valve discharge tube will be installed in accordance with P2803.6.1 of the 2012 IRC

Objective(s):
Discharge excessive energy (pressure or temperature) from storage tank to safe location

GOOD: T&P discharge should be piped within 6" of the floor or to outdoors

- Check local jurisdictional codes. reference 2012 IRC P2803.6.1:
- Temperature and pressure relief valve discharge pipes should not be connected to drainage system.
- T&P discharge pipes should be a clean line without valve or tee, flowing with gravity to an observable and safe location that cannot cause personal injury or structural damage -- the floor, an existing drain pan, a waste receptor, or to the outdoors.
- Pipe should not terminate more than 6" from floor, pan or waste receptor.

Airsealing Section



Air Sealing Holes

Desired Outcome
Prevent air movement through holes @ 50 Pascals of pressure

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),
- inside the pressure boundary select low volatile organic compound (VOC) sealants

Objective
Select safe and effective sealant

Material selection

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

Objective
Select safe and effective materials

Backing, infill, and support

Specification:

- 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.

Objective
Prevent excessive sealant movement and support applied loads

Surface preparation

Specification:

- Remove any material from the sealing area that will prevent full adhesion of the selected sealant.

Objective
Surface is clean and ready to accept sealant.

Air Sealing Holes (cont)

Sealant application

Specification

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.

Objective

Fully adhered, airtight, and durable seal

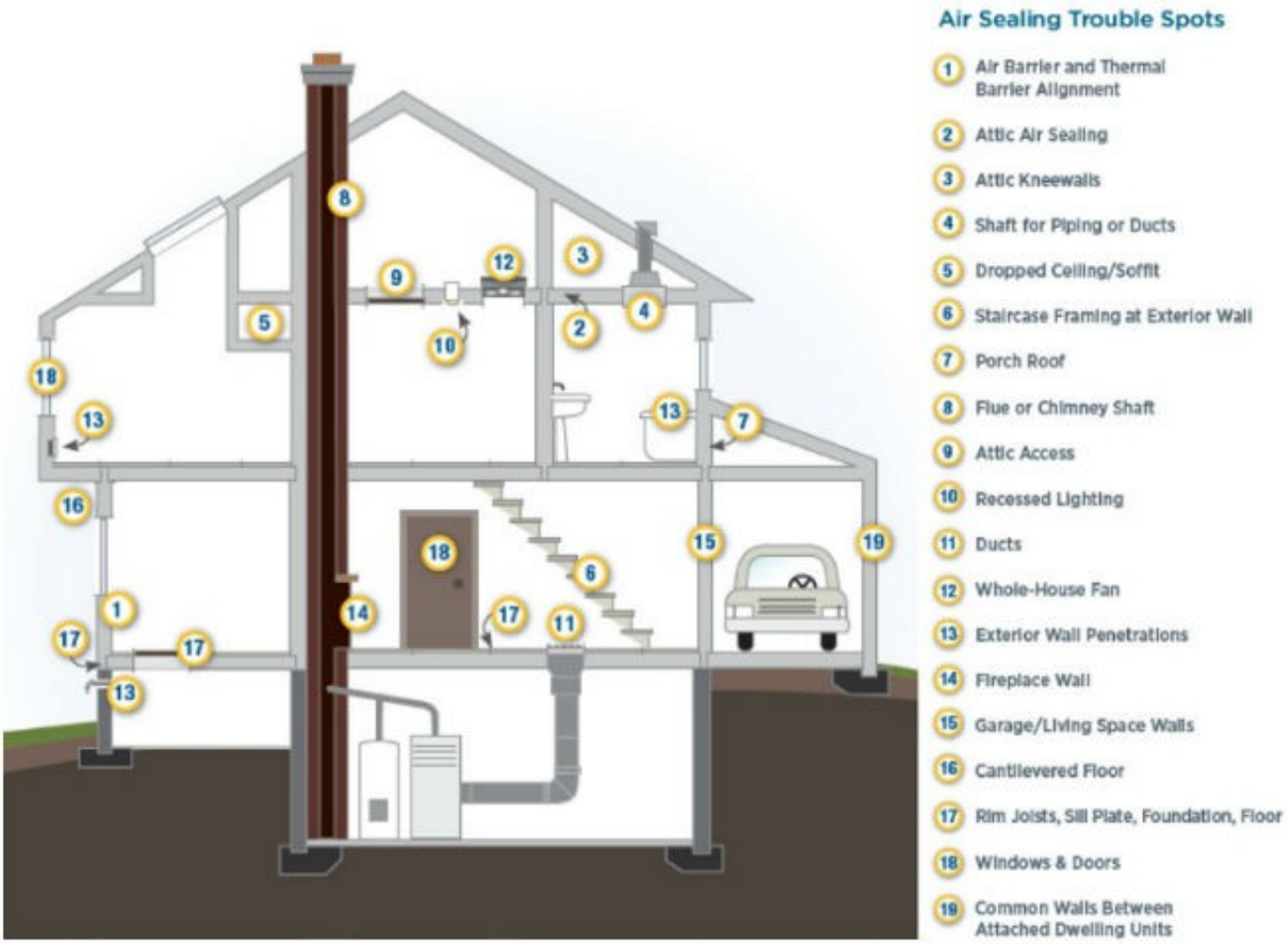
High-temperature application

Specification

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.) .

Objective

Prevent a fire hazard



Air Sealing Attics

Desired Outcome:
Penetrations and chases sealed to prevent air leakage and moisture movement between the attic and conditioned space.

Specifications:
Sealants will be compatible with their intended surfaces.

Sealants will allow for differential expansion and contraction between dissimilar materials.

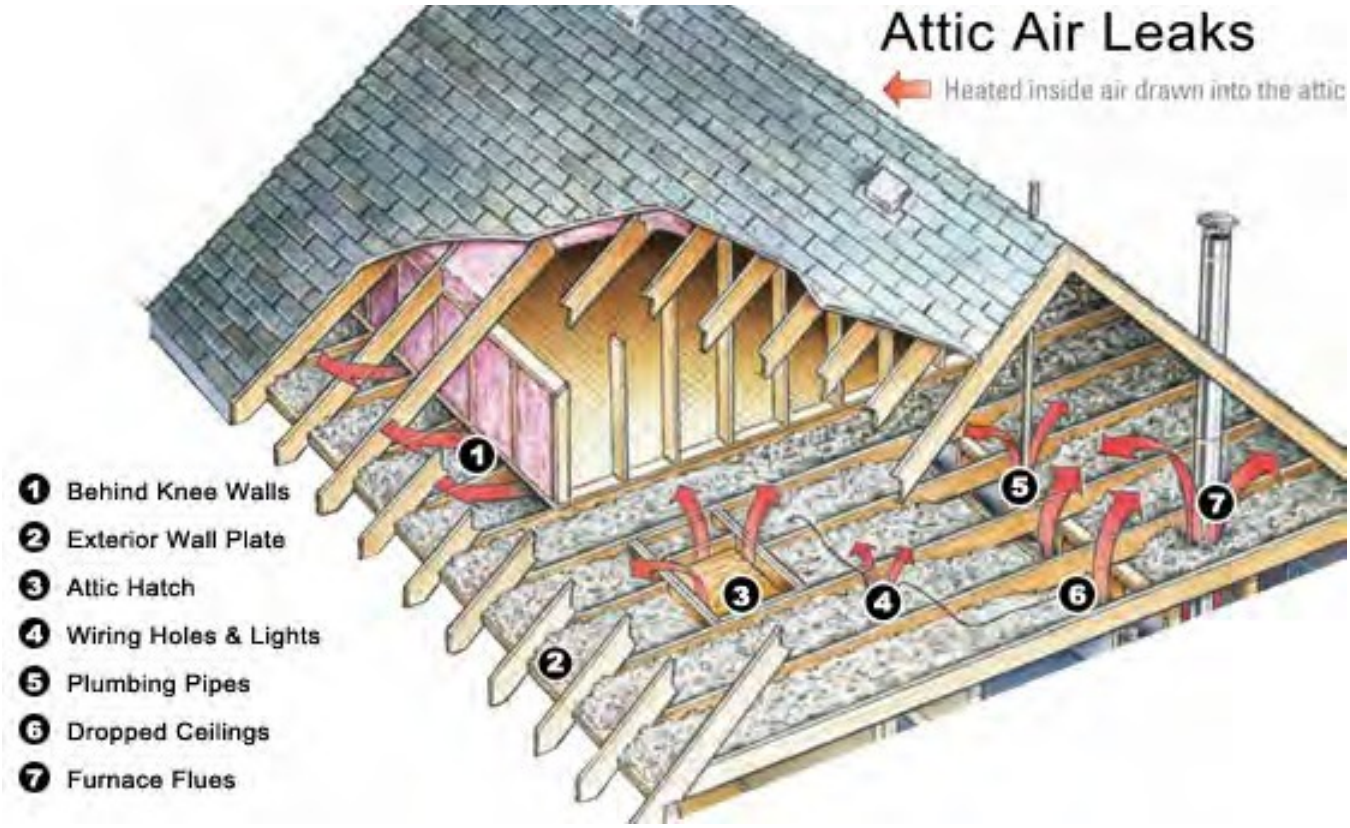
Sealants will be continuous and meet fire barrier specifications, according to authority having jurisdiction.

Objective(s):

Select appropriate sealant for a durable, long lasting airseal.

Should be able to pass smoke test or 50 pascal pressure difference with less than 1 pascal leakage.

Ensure sealant meets or exceeds the performance characteristics of the surrounding materials



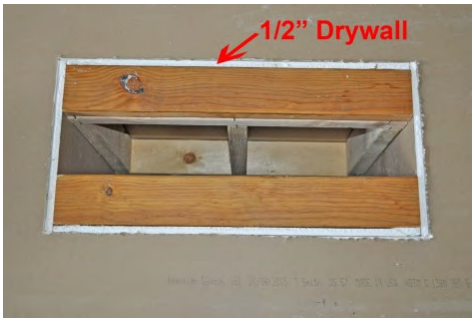
Air Seal Chase

Desired Outcome:
Chase capped to prevent air leakage and moisture movement between the attic and conditioned space

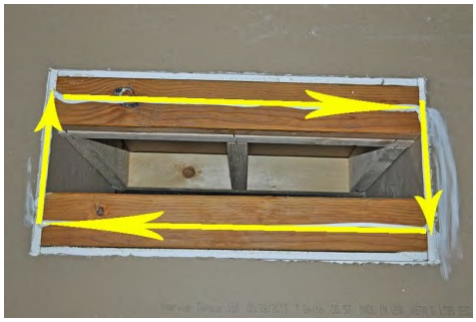
Specification(s):
Entire opening will be spanned with rigid material, if span exceeds 24" support use appropriate material

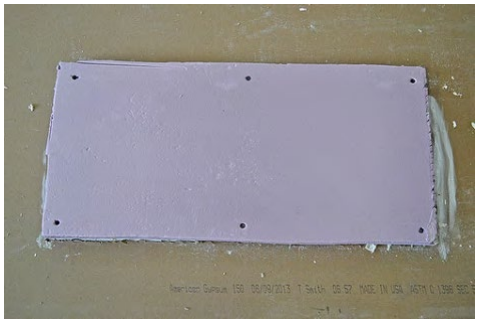
Material will be cut to fit and fastened as required.

Objective(s):
Reduce opening to what can be sealed with sealant



Clear area of debris and insulation in preparation for work


Apply sealant all the way around opening


Fasten rigid material appropriately, such as with screws

Sealing Chase That Does Not Meet Flame and Smoke Spread

Specification:
Material will be used that can be exposed to the interior of the house and meet the flame and smoke spread indexes as required in 2012 IRC R302.9

Objective(s):
Prevent a fire hazard

Paneled drop soffits typically are more combustible than plain drywall

When sealing on attic side use 5/8 inch drywall, fasteners and sealant

Sealing Methods for Attic Penetrations

Desired Outcome:
Continuous air barrier prevents air leakage and moisture movement between the attic and conditioned space

Specification(s):

Entire opening will be spanned with rigid material in line with the ceiling level

Material will be cut to fit and fastened as required or

Wall below openings will be dense packed or

Wall below openings will be bridged and sealed with spray polyurethane foam (SPF).

Sealants will be used that prevent visible air movement

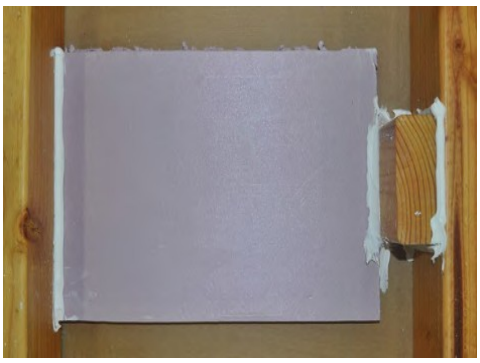
Objective(s): Prevent air leakage from wall cavity to attic

Wall cavities are open to attic

Verify test for no visible air movement

Option 1: Dense pack cavities through wood cap fastened in place

Option 2: Bridge cavities with spray foam



Option 3:Cap with XPS or drywall, seal exposed gaps

Sealing Dropped Ceiling

Specification(s):

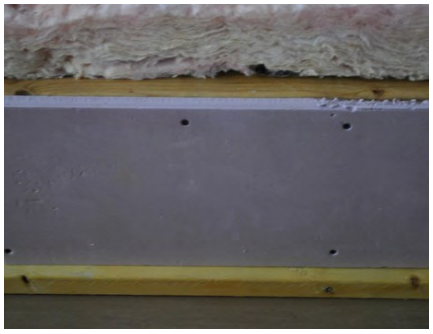
- Entire opening will be spanned with rigid material in line with the ceiling level.
- Material will be cut to fit and fastened as required.
- Side of stud bays will bore sealed with rigid material from bottom of dropped ceiling to top-plate or
- Wall below openings will be dense packed or
- Wall below openings will be bridged and sealed with SPF

Seals will be used that prevent visible air movement using chemical smoke at 50 pascals pressure diff.

Objective(s): Prevent air leakage from dropped ceiling to attic

Prepare work area by removing existing insulation and debris

Option 1, Cover openings with rigid material, either XPS or drywall



Option 2: Seal with rigid material along face of stud cavities

Option 3: Dense pack cavities through fastened wood plate

Option 4: Bridge cavities at new ceiling level with wrapped batts and SPF

Whatever option chosen, test to verify no air leakage

Dropped Ceiling and Soffit Above Closets and Tubs

Desired Outcome: Continuous, airtight barrier between attic and conditioned space.

Specification:

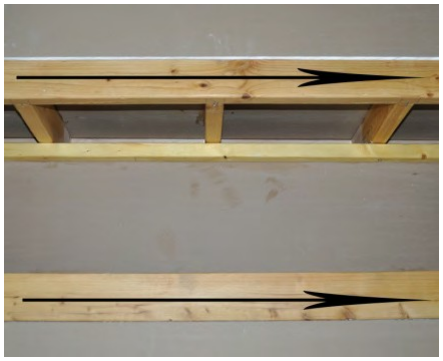
- Entire opening will be spanned with rigid material in line with the ceiling level
- Material will be cut to fit and fastened as required

Options

1. Side of stud bays will be sealed with rigid material from bottom of dropped ceiling to top-plate.
2. Wall below openings will be dense packed.
3. Wall below openings will be bridged and sealed with SPF.

Objective:

- Prevent air leakage from dropped ceiling to attic.
- Seals able to withstand 50 pascals of pressure difference.



Option 1, Step 1: Apply sealant to top-plates or other relevant surfaces

Option 1, Step 2: Cover soffit with rigid material, such as drywall

Option 1, Step 3: Secure the rigid material with screws

Option 2: Cover face of stud bay with rigid material, like PS or plywood

Option 3: Dense pack cavity through fastened wood

Option 4: Bridge stud bay with wrapped fiberglass and spray foam

Sealing Tongue and Groove Ceilings

Desired Outcome:
Tongue and groove ceilings sealed to prevent air leakage and moisture movement between the attic and conditioned space

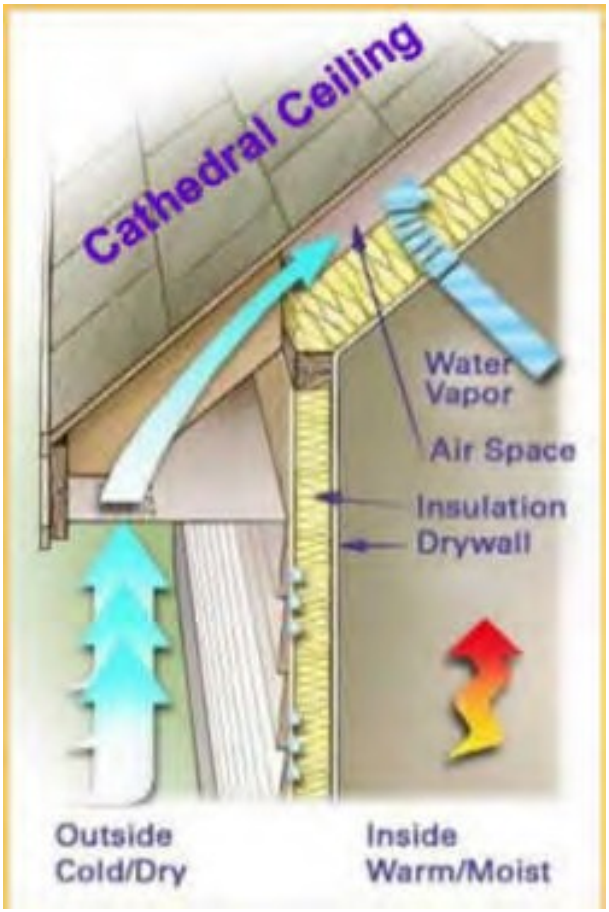
Specification(s):
Sealants will be compatible with their intended surfaces.

Sealants will be continuous and meet fire barrier specifications, according to authority having jurisdiction.

Objective(s):
Select permanent sealant.

Ensure sealant meets or exceeds the performance characteristics of the surrounding materials.

Ensure ceiling remains aesthetically pleasing.



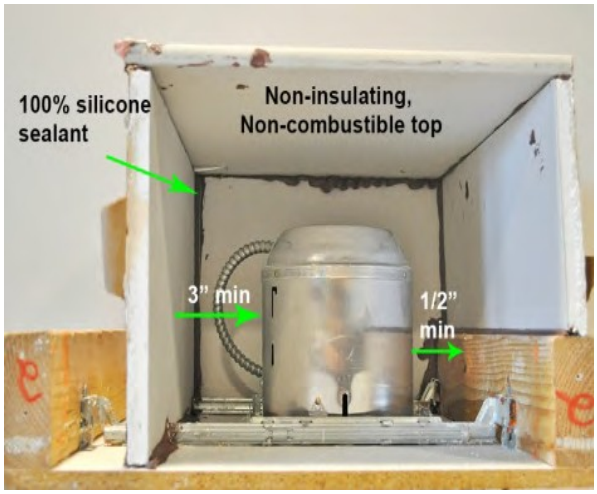
Sealing Non-Insulation Contact (IC) Recessed Lights

Desired Outcome:
Ensure safety from fire and prevent air leakage,

Measure less than one pascal using a pressure pan with Blower door at 50pa.

Use one of these methods:

1. Replace with airtight, IC rated recessed fixture.
2. Replace with surface mounted fixture and opening sealed.
3. Air sealing measures as approved by the authority having jurisdiction.
4. A fire-rated airtight closure
   (i.e., equivalent to 5/8 fire code gypsum wallboard)



Sealed box around non-IC light


Sealed box should meet smoke and flame spread

- 3" clearance between enclosure and fixture.
- Enclosure height must be above surrounding insulation.
- Enclosure lid may not exceed R value of 1

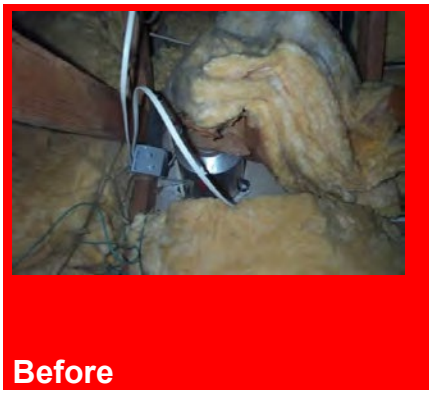
0.0101.1 Sealing a Non-Insulation Contact (IC) Recessed Light With an Integrated LED Retrofit Kit

NOTE: If LED retro kit installed in a non Insulation contact recessed light must follow above specification 3.0102.1- Sealing IC Lights

Select an LED trim kit that is:

- Energy Star qualified or equivalent or better, and safety lab tested
- Correct size for the can light in which it will be installed,
- Designed to provide an airtight seal,
- Provides lighting level quality required for the intended application
- Rated no more than the rated maximum wattage existing fixture
- Is rated to be connected to an existing dimmer switch

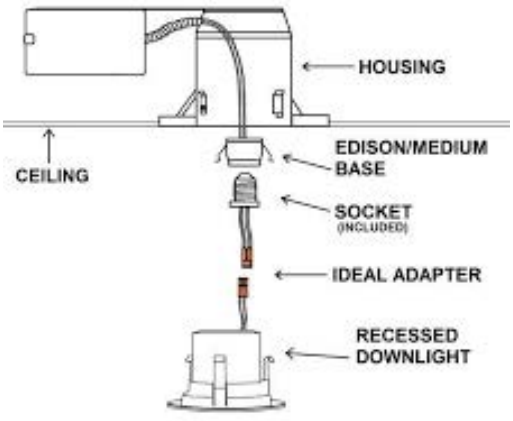
3.0102.1- Sealing IC Lights



Non-IC rated recessed light


Airtight IC rated recessed light


Recessed can adapter

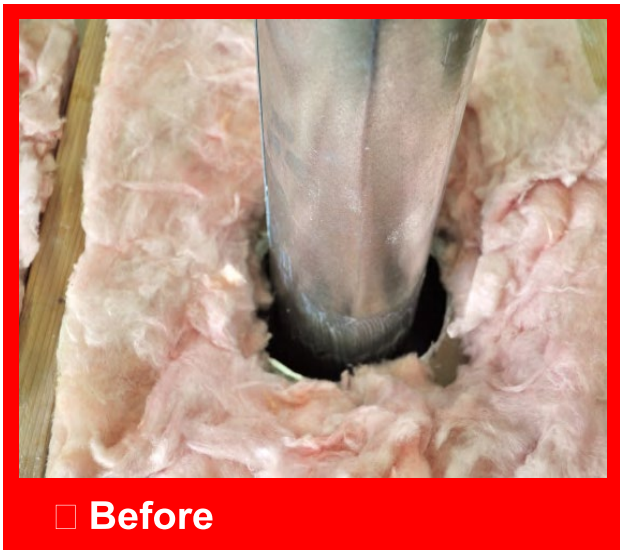


Fireplace Chimney and Combustion Flue Vents

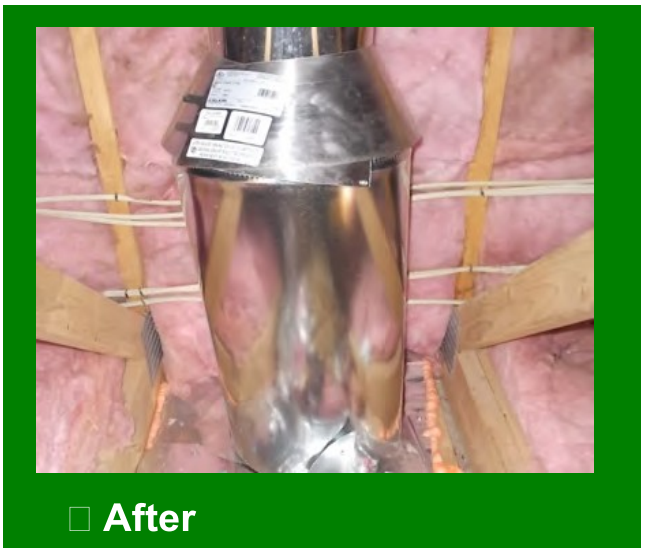
Desired Outcome:
Combustible materials kept away from combustion sources

Specification(s):

- Holes, penetrations, and bypasses will be sealed.
- Dams will be fixed in places that maintain required clearance.
- Alaska requires dam to be covered to prevent insulation from entering.
- Ensure insulation dams maintain clearance.



Does not meet clearance requirements



Properly installed insulation dam prior to insulating

1. Construct and install a rigid dam, ensure proper clearance per manufacturer spec between the dam material and chimney.
2. Air seal chimney penetration prior to damming combustion flue or chimney.
3. Fasten damming to substrate or framing to prevent it from moving.
4. Extend dam higher than the top of the insulation to be installed.
5. Ensure the dam material does not bend, move, or sag.

Masonry Chimney Insulation Dam

Air leak around masonry chimney, needs to be air sealed.

Rigid, non-combustible material should be used to construct seals and dams on chimneys

Only construct dam after sealing has been completed properly.

Damming is held in place with mechanical fasteners and maintains 3" clearance from chimney.

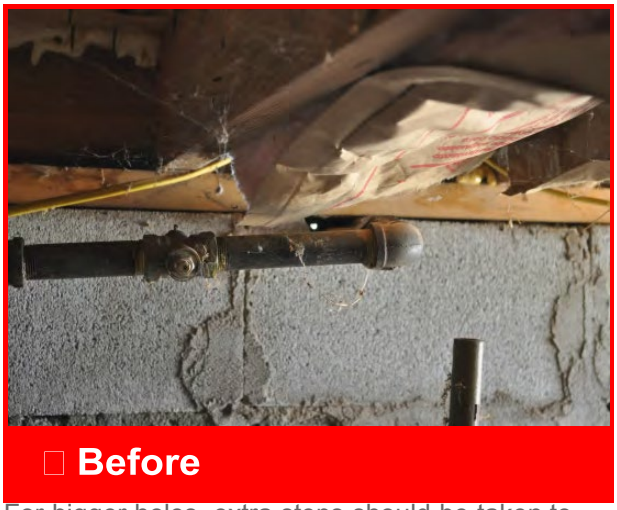
Crawlspace Exterior Wall Airsealing

Desired Outcome:
Well-sealed exterior wall prevents air leakage and pests intrusion.

Specification(s):
Apply a continuous seal at all seams, cracks, joints, penetrations, and connections of foundation walls, sills, floors, etc. that are adjacent to unconditioned spaces while applying sufficient pressure to push sealant into any gaps or cracks and contact any backing or infill material required.

Weatherstrip exterior access doors/hatches and seal door/hatch framing using compatible sealant.

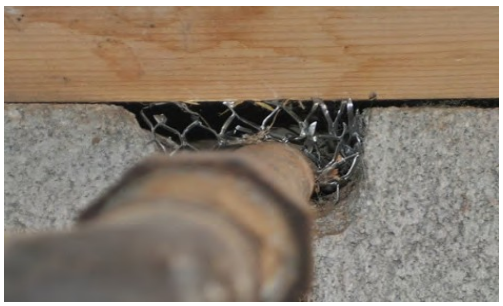
Objective
Prevent air and moisture intrusion.



For bigger holes, extra steps should be taken to keep out pests

Choose the backing and infill strategy that works best for the hole size

Note: If there is evidence of pests entering vented crawlspace these same techniques can be used to exclude pests.


Metal mesh or other rigid materials should be cut to fill the space

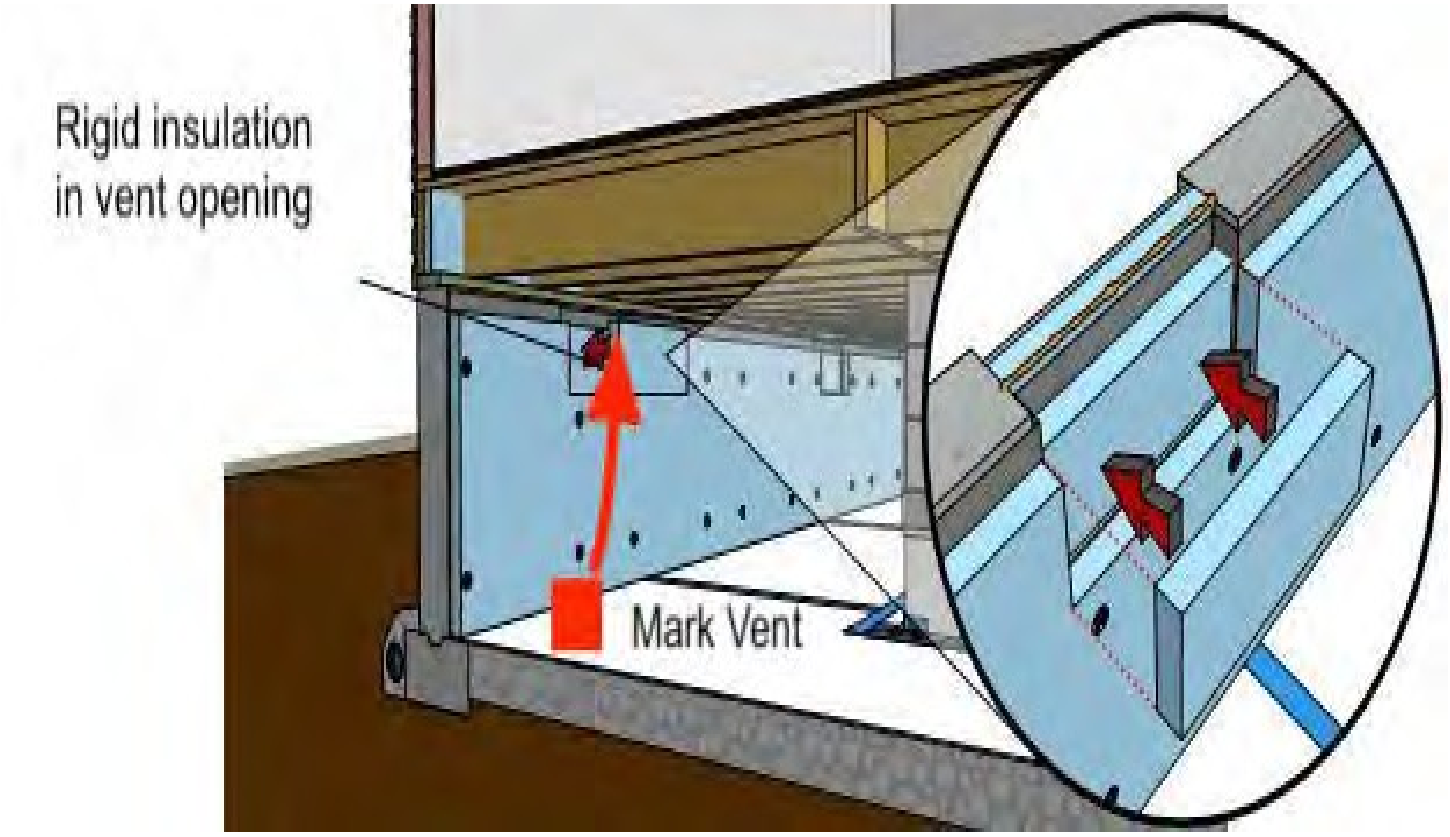
For holes larger than 1/4", rigid backing should be used to keep pests out

Crawlspace Vent Closure

Desired Outcome:
Prevent unconditioned outside air and moisture from entering through the existing vent into the crawl space blocked.

Specification(s):
Vent opening can be sealed with removable plug marked from inside with survey tape.

Objective(s):
Reduce air infiltration and moisture penetration.



Floor Airsealing Before Insulating

Desired Outcome:

Prevent air movement through holes @ 50 Pascals of pressure
Consistent, uniform thermal boundary between conditioned and unconditioned space to prescribed R-value of an adjoining insulated assembly

Specification(s):
Sealing the floor system will be completed before insulating

Objective(s): Ensure airtight envelope

Locate gaps around penetrations for plumbing, electrical, etc.

Fill gaps greater than 1/4 inch with backer rod or spray foam

Caulk smaller gaps and to hold backer rod in place

open tub chase

Seal large tub chase using rigid foam then caulk or foam edges

Be alert to high-temperature flues and chimneys and use appropriate sealants and materials.

Isolating Garage from Living Space

Desired Outcome:
Garage isolated outside the dwelling pressure boundary with durable, safe seals that remain in place and prevent air movement @ 50 Pascals of pressure.

Specification(s):
Apply a continuous seal at all seams, cracks, joints, penetrations, and connections between garage and living space while applying sufficient pressure to push sealant into any gaps or cracks and contact any backing or infill material required.

Seal penetrations to minimize risks and air leakage from garage to house

Doors adjacent to conditioned spaces

Specification(s):

- Install weather stripping, door sweep, and/or threshold if needed so that door is significantly airtight.
- If door is replaced, door must meet fire separation requirements.
- Also a spring hinge to insure door closure.

Door sweep, with weatherstripping, will minimize air exchange with garage

Garage Ductwork

Desired Outcome:
Openings from garage sealed to prevent leakage

Specification(s):

- Seal all accessible ductwork joints and connections with UL 181B or 181B-M welds, gaskets, adhesive mastics, or mastic-plus- embedded-fabric systems.
- Where the same duct system serves any other living space, all supply and return openings in the garage (including intentional openings designed to heat or cool the garage space) must be disconnected, capped with sheet metal using mechanical fasteners, and completely sealed.

Objective(s):
Prevent ductwork from distributing pollutants.

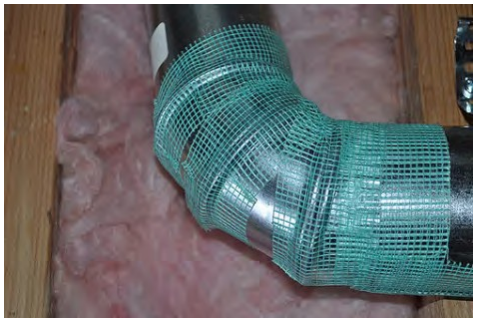
Unsealed joints and connections need to be sealed to prevent health risks.

Sealed ductwork connections help prevent leakage.

Materials:

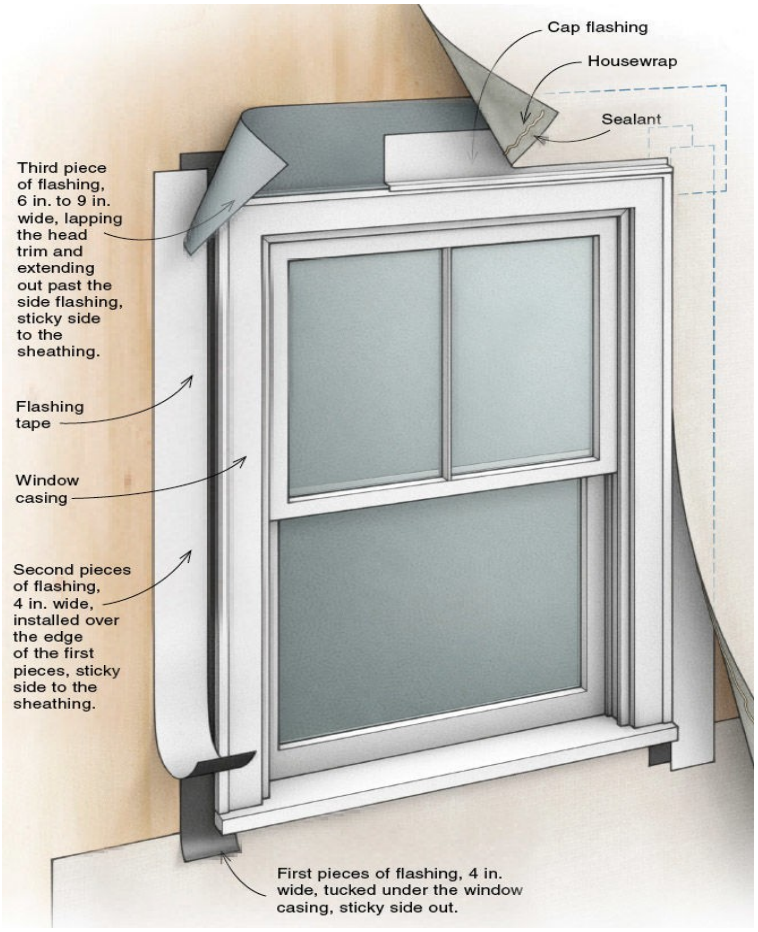
1. Mesh tape
2. Mastic


Prepare work area by assessing any safety concerns.


Wrap joint with fiberglass mesh tape.


Apply UL 181 mastic to seal joint.

Window Replacement



Desired Outcome

Continuous, weather-tight air and thermal boundary

Window selection

Specification

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

Meet the egress and safety glass requirements of the location where they are installed.

Objective

Choose correct and safe new window

Installation

- Install new window in accordance with manufacturer specifications in alignment with the wall system's air and thermal boundary.
- Install flashing per the manufacturer's specifications.
- Gaps between the new window and existing opening will be sealed with low-expanding foam or equivalent sealant.
- Final installation will be air and watertight.

Objective

Continuous and contiguous air and thermal boundary.

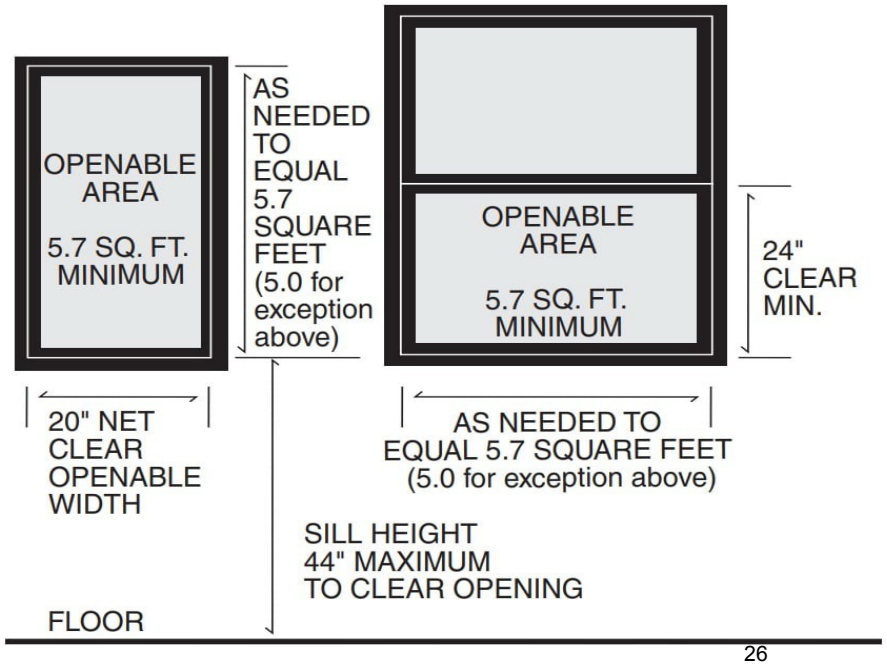
Safety

Specification

Verify safe operation of windows as required by local codes

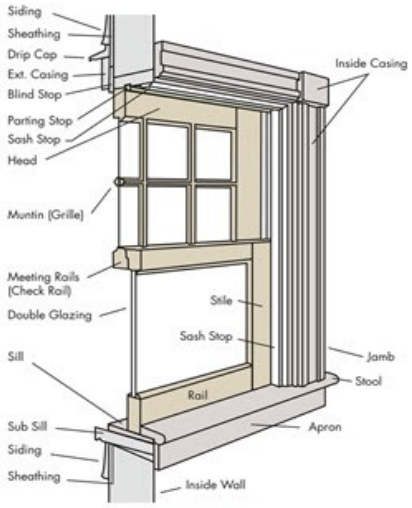
Objective

Safe operation maintained

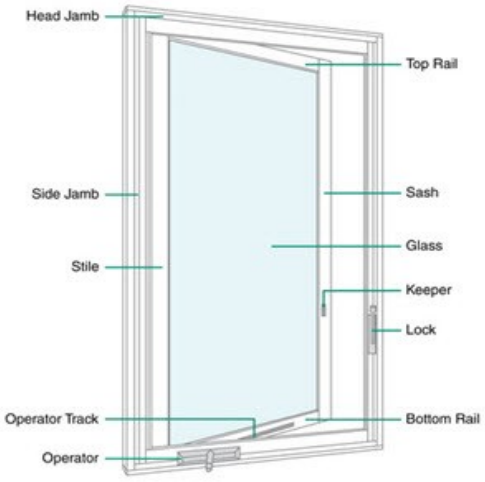


Window Air Sealing

Desired Outcome
Weathertight window repairs



Double Hung



Casement

Surface preparation

- Remove any material from the sealing area that will prevent full adhesion of the selected sealant
- Remove any material from the sash contact areas that will prevent a tight seal or safe operation.

Objective
Surface is clean and ready to accept sealant

Operation and fit

- Adjust window sash(es) to properly fit the jamb and allow for ease of operation and security.
- Verify intentional drainage is functioning correctly.

Objective
Proper window sash operation and drainage

Sash stops and locks

- Install new or adjust existing sash stops so as to eliminate visible gaps between the stop and window jamb while ensuring sash operates smoothly and securely.
- Adjust existing lock or install new 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).

Objective
Proper window sash operation and drainage

Weatherstripping

- Remove existing weather stripping or sealing strips that are damaged.
- Install continuous and complete weather stripping on the bottom of the lower sash where it makes contact with the sill and at the top of the upper sash where it makes contact with the upper part of the window frame while maintaining the operability of the window.
- Mechanically installed weather stripping will be sealed to surface.

Objective
Operable, weathertight sash

Exterior weatherproofing

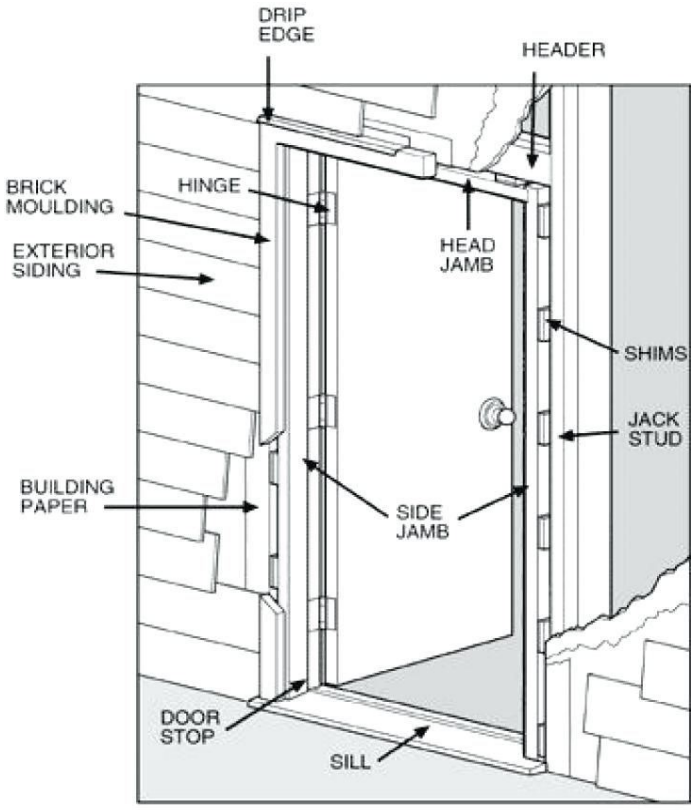
- Replace any missing/damaged weatherproofing on exterior portions of window (flashing, glazing, caulking, sealant, paint, etc.).
- Seal any holes in frame left by abandoned hardware.
- Do not seal weep holes or intentional drainage locations.

Objective
Prevent water intrusion

Door Replacement

Desired Outcome

Continuous, weather-tight air and thermal boundary that maintains door operability.



EXTERIOR DOOR INSTALLATION

Door selection

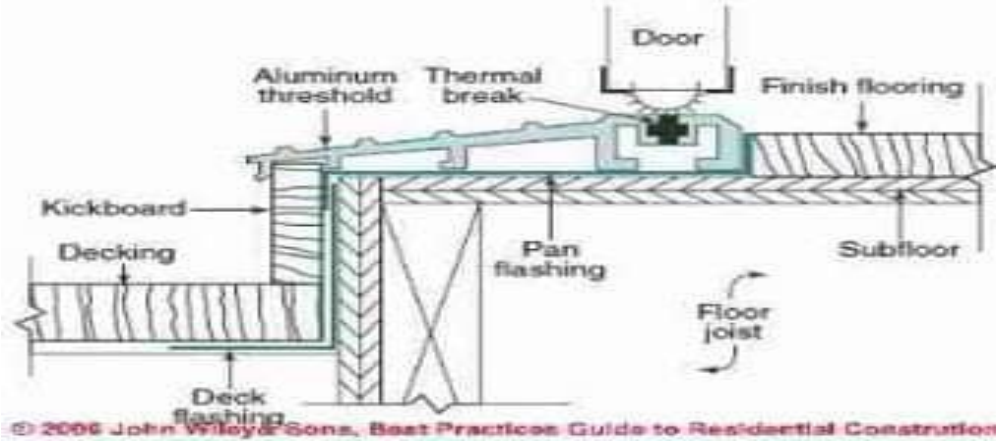
- Select doors that meet the SHGC, U-value,and air leakage requirements of the work order.
- Meet the egress and safety glass requirements of the location where they are installed.

Opening preparation

- Remove existing door frame and all components.
- Replace any damaged or rotting framing.
- 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 level and firm installation.
- Seal the rough opening to the wall system's air and thermal boundary with non-expanding sealants.
- Install flashing to direct water away from the door opening in accordance with manufacturer's instruction.

Installation

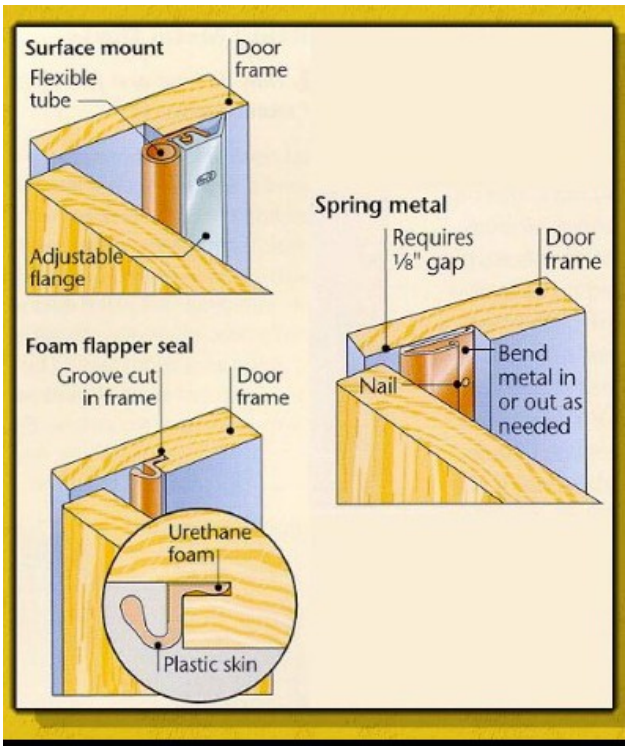
- Install new door in accordance with manufacturer specifications in alignment with the wall system's air and thermal boundary.
- Install exterior flashing and weatherstripping per the manufacturer's specifications.
- Gaps between the new door frame and the rough opening will be sealed with low-expanding foam.
- Door rail (bottom) and threshold will be adjusted to ensure tight but operable fit.
- Final installation will be air and watertight.



Door Air Sealing

Desired Outcome

Weather and airtight door repairs that maintain operability



Surface preparation

- Remove any material from the sealing area that will prevent full adhesion of the selected sealant.
- Remove any material from the sash contact areas that will prevent a tight seal or safe operation.

Objective

Surface is clean and ready to accept sealant

Operation and fit

- Adjust door hinges and slab to properly fit the jamb and allow for ease of operation and security.
- Verify intentional drainage is functioning correctly

Proper door operation

Handle/lockset

- Adjust or replace handle, lockset, or strike plate so that door closes tightly without hindering safe operation of latching or locking mechanisms

Proper latching mechanism function

Weather stripping

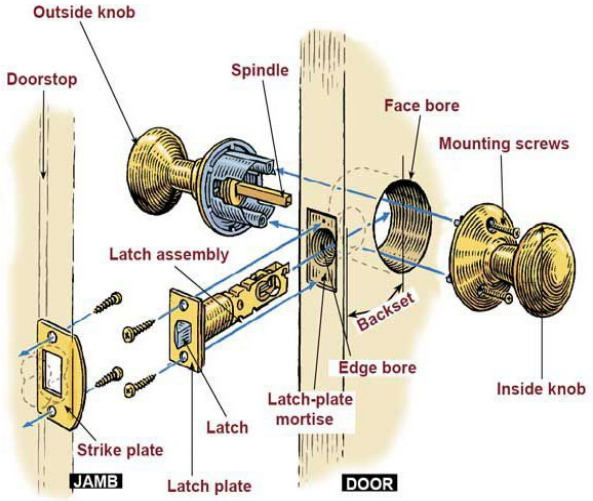
- Remove existing weather stripping and clean surface.
- Install continuous and complete weather stripping for sides and top of door so no visible gaps exist when the door is closed.
- Lap exterior weather stripping to channel water away from the door.
- Install a door sweep on the bottom of the door slab with no visible gaps when door is closed.
- Seal mechanically installed weather stripping to installation surface.
- Operation may not be interfered with by any installation.

Complete seal of door slab

Door stop

- Seal door stop to door frame

Complete seal of door frame



Exterior weatherproofing

- Replace missing/damaged weatherproofing on exterior (seals, flashing, glazing, caulking, sealant, paint).
- Seal any holes in frame left by abandoned hardware.
- Adjust and seal threshold as needed.

Prevent water intrusion

Safety

- Verify safe operation of door and all components.
- Where doors are required to have a fire-resistance rating,
- all weather strips and sealants applied to the door will be compatible with door.
- Safe egress and fire safety maintained.

Insulation Section

Insulation Onsite Documentation

This requirement applies whenever insulation is installed :

Specification:
A dated receipt signed by the installer will be provided that includes:

- Insulation type
- Coverage area
- R-value
- Installed thickness and settled thickness
- Number of bags installed in accordance with manufacturer specifications

Reference 16 CFR 460.17:
The installer, must provide the customer or client documentation regarding the insulation installed.

Documentation will indicate the coverage area, thickness, and R-value of the insulation.

The insulation certification must be dated and signed by the installer.

Insulation certificate to be posted at entrance to attic or crawlspace and a copy shall be provided for project file.

To figure out the R-value of the insulation, use the data that the manufacturer gives you.

Information on insulation installed should be posted nearby

Eave Baffling

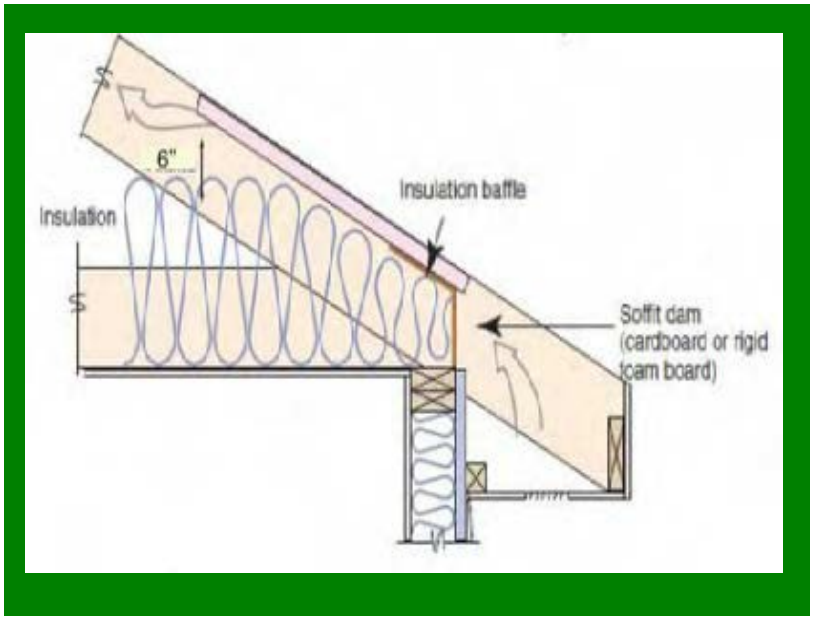
Desired Outcome:
Attic ventilation meets code requirements and insulation is protected from wind washing

Specification(s):
If soffit venting or eave venting is present, baffles will be mechanically fastened to block wind entry into insulation or to prevent insulation from blowing back into the attic

If soffit venting or eave venting is present, baffles will be installed to maintain clearance between the roof deck and baffle

Installation will allow for the highest possible R-value above the top plate of the exterior wall

Insulation should not block vented eaves



Baffles shall have min 1" air space &
prevent insulation from falling into eave

Baffle shall extend vertically a minimum of 6" above the final level of the insulation. Mechanical fasteners shall permanently affix baffle in place.

Knee Wall Airtight Backing

Desired outcome:
Airtight cavity and properly insulated knee wall.

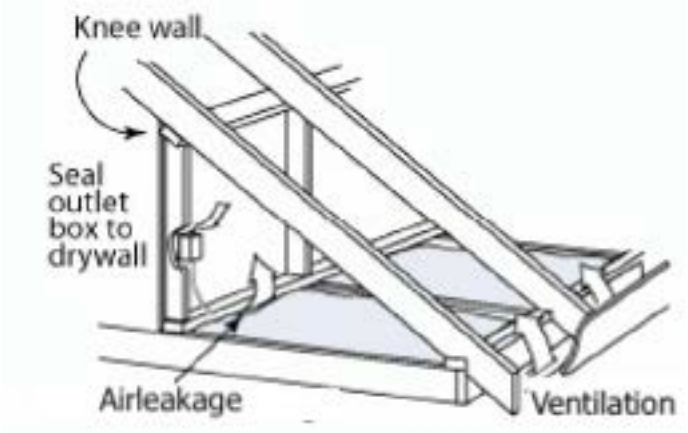
Specification(s):
All knee walls will have a top and bottom plate or blockers installed using a rigid material.

All joints, cracks, and penetrations will be sealed in finished material, including interior surface to framing connections.

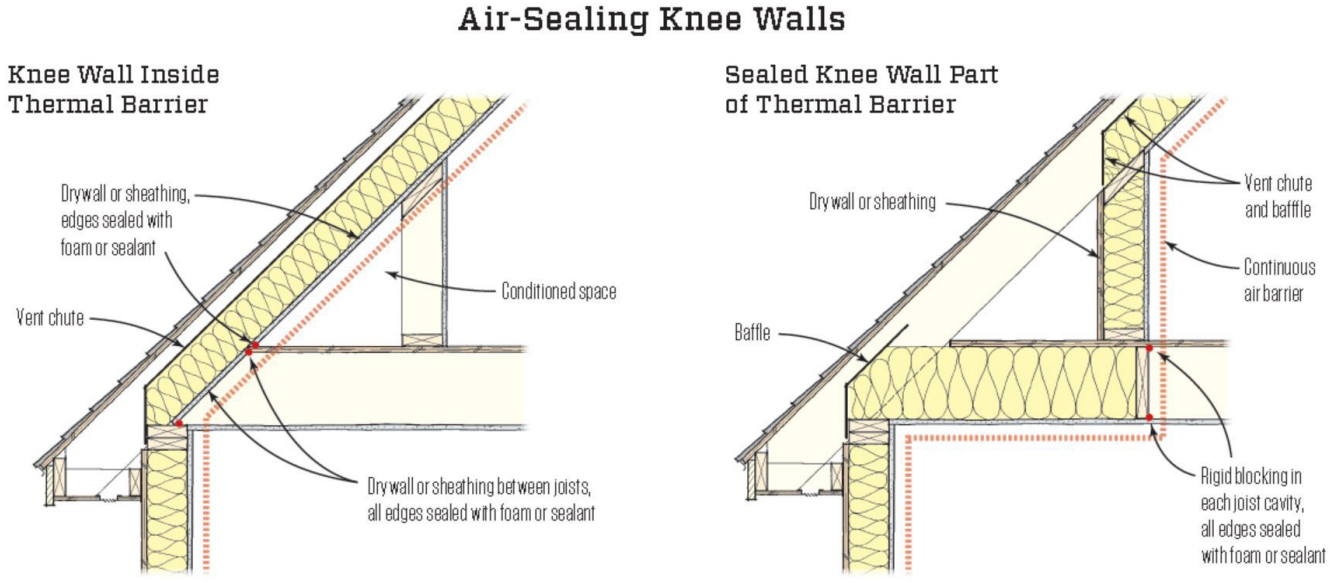
Objective(s):
Eliminate bending, sagging, or movement that may result in air leakage.

Prevent air leakage through the top or bottom of the knee wall.

Create an air barrier.



Unsealed joist cavity below knee wall



Knee Wall Airseal Backing (Example)

Top plate has been cut and fit to size

Top plate has been sealed to adjacent framing

Bottom plate is also missing. Space is measured so XPS can be cut

Bottom plate is cut to size

Bottom plate is placed in line with interior air barrier

Bottom plate is sealed to surrounding joist and framing

Knee Wall Batt Installation

Desired Outcome:
Airtight cavity and properly insulated knee wall

Specification(s):
Insulation will be installed using one of the following methods:

- New batts will be installed in accordance with manufacture specifications
- All existing batted insulation will be adjusted to ensure it is in full contact with the interior cladding and the top and bottom plates

Objective(s):
Eliminate misalignment of existing insulation

Where existing insulation is improperly installed, fix it

Kraft-face should go to warm side and batt should fill bay

Batts should fill entire volume of knee wall stud bays

Attic Prep-Cavity Access Checklist

Desired Outcome:
Consistent, thermal boundary between conditioned and unconditioned space controls the heat flow

- Subfloor or drywall will be removed to access cavities as necessary, including inaccessible knee- wall attic floor spaces**.**
- Insulation will be adequately marked for depth a minimum of every 300 square feet of attic area, with measurement beginning at the air barrier.
- All electrical boxes will be flagged to be seen above the level of the insulation.
- Open electrical junctions will have covers installed.
- Insulation dams and enclosures will be installed as required.
- Access the workspace.
- Verify uniformity of insulation material.
- Provide location of electrical boxes for future servicing.
- Prevent an electrical hazard.

Before

Accessible attic floors should be air sealed and insulated

After

Depth markers and insulation dams aid in proper insulation of attic spaces

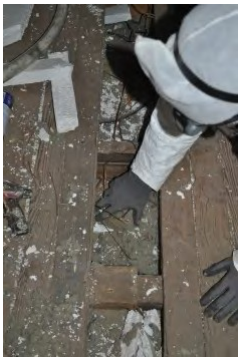
Attic Prep-Cavity Access

Tools:

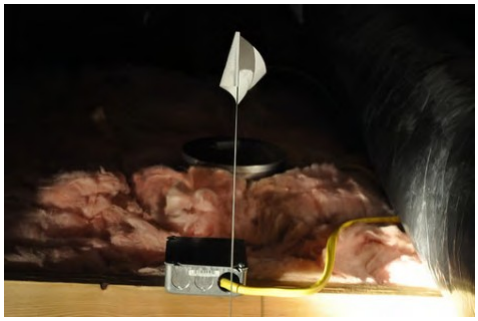
1. Pry bar
2. Hammer
3. Caulk gun
4. Utility knife
5. Staple gun
6. Spray foam gun
7. Tape measure

Materials:

1. Flags
2. Depth markers
3. Staples
4. XPS
5. Caulk
6. Spray foam



Check cavity for electrical junctions and penetrations



Flag and install covers on electrical junctions

Seal any penetrations

Non-IC (insulation contact) can lights should be covered with a dam and have no insulation on top

Install depth markers and insulation dams above height of insulation

Attic Floor Loose Fill Insulation

Desired Outcome:
Continuous, contiguous, safe, and compliant thermal barrier installation.

Specification(s):
Install loose fill insulation to prescribed R-value in every joist bay in full contact with the air barrier without gaps, voids, compressions, or misalignments.

Objective(s):
Continuous and contiguous pressure and thermal barrier of consistent R-value.

Before

Insufficient level of insulation allows heat loss and wasted energy.

After

Attic floor blown with loose fill, achieving R-value of program requirements.

Tools:

1. Insulation machine
2. Rake or stick to level insulation as needed

Materials:

1. Loose fill insulation
2. paper rulers to mark insulation depth
3. Insulation manufacturer's coverage chart

Attic Blow-in Insulation Installation

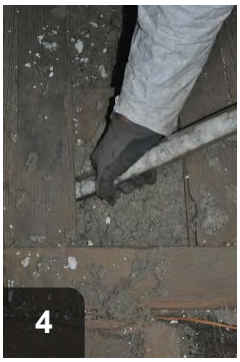
Adjust machine settings for loose fill: open gate for high material flow, allow enough air pressure to avoid clogging.

Use depth markers to ensure

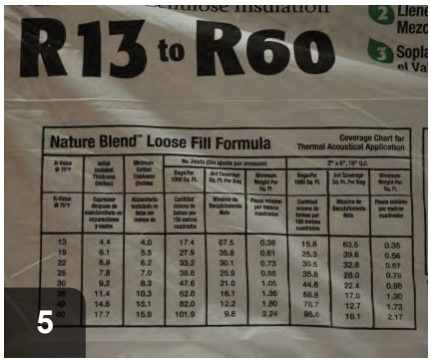
insulation has reached prescribed R-value

PPE for attic includes N-95 respirator

or greater, gloves, and coveralls.



Where flooring cannot be removed, verify insulation is meeting R-value goal



Use the manufacturer's coverage chart to ensure R-value and post the chart with the insulation certificate

Pull-Down Stairs

Desired Outcome:
Pull-down attic stair properly sealed and insulated

Specification(s):
Insulate access to the same R-value as adjoining insulated assembly.

Pull-down stair rough opening will be surrounded with a durable dam that is higher than the level of the attic floor insulation.

Counter-weights should be considered to ease accessibility for excessively heavy hatches

Objective(s):
Achieve uniform R-value

Prevent loose insulation from entering the living area

Before

Insulation needs to be dammed to keep from falling through during operation

After

Insulated pull-down stairs installed to prevent air leakage and thermal loss

Attic Access Door and Hatches

Desired Outcome:
Attic access door properly sealed and insulated

Specification(s):
Insulate access to the same R-value as adjoining insulated assembly.

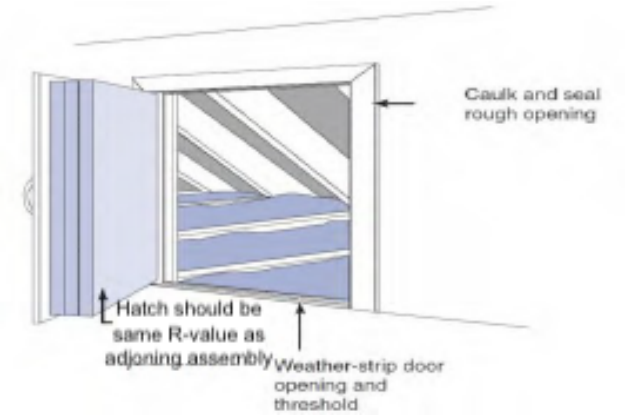
Attic hatches rough opening will be surrounded with a structurally durable protective baffle that is higher than the level of the surrounding attic floor insulation.

Objective(s):
Attempt to achieve uniform R-value on the attic door or hatch

Achieve uniform R-value on the attic floor

Prevent loose attic floor insulation from entering the living area

Hatch cover or panel access door should match r-value of attic insulation



Alternate installation for vertical access panel to attic

Materials:

1. Baffle or damming around horizontal access: 1/2" plywood or OSB.
2. Fiberglass batt or rigid foam to achieve R-value on hatch.
3. Strapping to attach fiberglass batt to access hatch.
4. Adhesive or fasteners to attach rigid foam to access hatch.

Ensure ceiling hatch is tight fitting and if necessary weatherstripped or caulked to prevent air leakage between conditioned space and attic.

Ground Vapor Retarder in Unvented Crawlspace

Desired Outcome:
Minimize ground moisture vapor and soil gas with a durable, effective vapor retarder

Specification(s):
A ground moisture barrier that covers 100% of the exposed crawl space floor will be installed A ground moisture barrier with a minimum of 6mil thickness and rating of no more than 0.1 perm will be used.

Objective(s):
Reduce ground moisture entering the crawl space

Uncovered crawl space floors can cause moisture damage

Ground moisture barrier to cover 100% of floor is installed last

- Extend ground vapor retarder a minimum of 6" up all foundation walls and piers,
- All seams shall overlap a minimum of 12 inches.
- Seal all seams and connections to foundations and piers air tight with a durable, compatible, sealant.
- Poly shall not be in direct contact with non-treated wood.
- Mechanically attach ground vapor retarder to foundation and piers, where practical.
- Where necessary, poly shall be fastened in place using landscape staples, spikes with washers or ballast to prevent shifting caused by routine access or other factors such as sloping grade or wind.

Crawlspace Signage

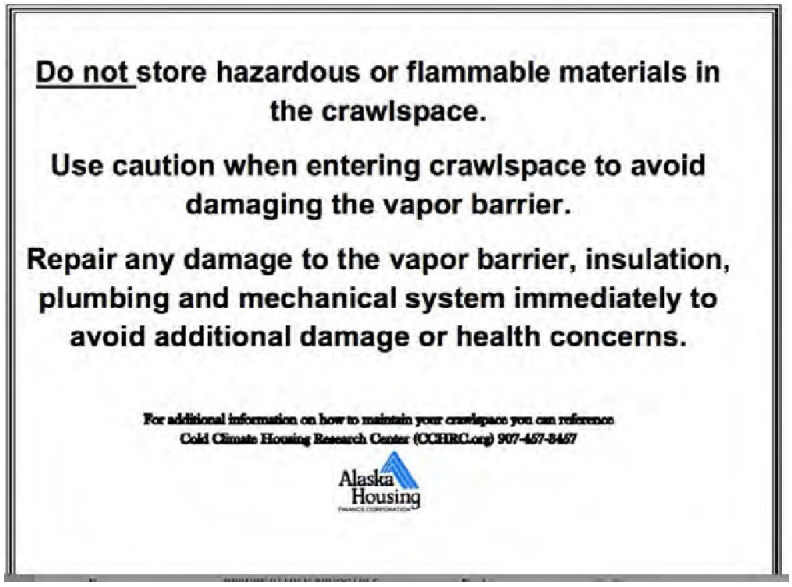
Desired Outcome:
Posted signs inside of the crawl space provide essential safety and maintenance information to occupant and users of the crawl space.

Specification(s):
Install a durable (minimum of 10-year service life), easily seen sign, sized a minimum of 8.5"x 11" at each access to the space.

Sign shall minimally include the following items:

- Warning to prohibit storage of hazardous and flammable materials.
- Caution not to damage the ground vapor retarder, air barrier, insulation, and mechanical components specific to the space.
- Immediate repairs are needed in the case of damage.

Objective(s):
Provide essential safety and maintenance information



Sample

Underfloor-Securing Batts

Desired Outcome:
Consistent, uniform thermal boundary between conditioned and unconditioned space to prescribed R-value of an adjoining insulated assembly.

Specification(s):
Batts will be secured with physical fasteners.

Objective(s):
Ensure insulation remains in contact with subfloor .

Batt must be in contact with subfloor without voids, gaps or being compressed

Twine fastened across bays in a zig- zag pattern

FLOOR SUPPORT MATRIX						
Floor Type	**Support Material**	**Material requirements**	**Maximum Spacing**	**Acceptable patterns**	**Minimum fastener type**	**Minimum fastener depth**
Joist up to 24"	Lath	3/8X1.5"	20"O.C.	Across floor joists	Corrosion resistant 3/8"crown 18AWG	5/8"
Joist up to 24"	Twine	150 LBS. polyester, polypropylene or nylon	12" O.C.	Shoelace/Zigzag (must be stapled at each joist	Corrosion resistant 3/8"crown 18AWG	5/8"
Post &Beam over 32" O.C.	Lath	3/8X1.5"	20" O.C.	Across floor beams up to 54". If over 54" need center support	Corrosion resistant 3/8"crown 18AWG	5/8"
Post &Beam over 32" O.C	Twine	150 LBS. polyester, polypropylene or nylon	12"	Shoelace up to 54" across. If over 54" need center support	Corrosion resistant 3/8"crown 18AWG	5/8"

Required twine or lath support for floor insulation, tiger teeth prohibited

Floor Netting Install

Desired Outcome:
Consistent, uniform thermal boundary between conditioned and unconditioned space to prescribed R-value of an adjoining insulated assembly.

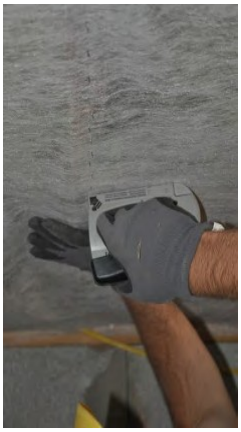
Specification(s):
When using netting or fabric, staples will be placed according to manufacturer specifications.

Netting or fabric will meet local fire codes.

Objective(s):
Secure insulation

Secure netting across each joist to create separate cavities

Secure netting across sills to prevent leakage of insulation



Keep netting taut while stapling to prevent wrinkles and leakage

Staples should be kept tightly together, placed no more than 1 1/2" apart

Dense Pack Floors above Garage

Desired Outcome:

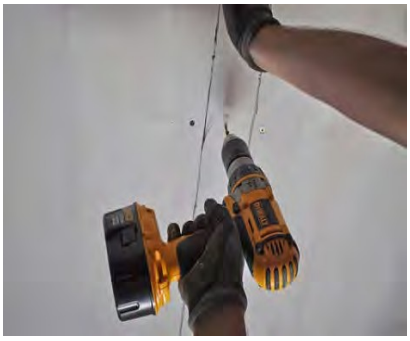
Continuous, contiguous, safe, and compliant thermal boundary that prevents air movement @ 50 Pascals

Specification(s):

- Each cavity will be 100% filled to consistent density
- Cellulose material will be installed to a minimum density of 3.5 pounds per cubic foot

Note: The number of bags installed will be confirmed and will match the number required on the coverage chart

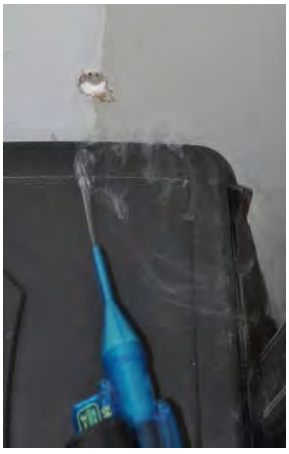
Blow insulation into cavities to density appropriate for chosen material



Close cavities with access panel cut out at the beginning

Cut small test hole to verify density

Set up blower door and depressurize bonus room to -50pa wrt outside



Chemical smoke at 50pa indicates insulation is at appropriate density

Tape and spackle access panel and test holes to repair garage ceiling

Dense Pack in Joisted Cavities with Rigid Barrier

Desired Outcome:
Continuous, contiguous, and safe thermal boundary that prevents air movement @ 50 Pascals

Once rigid barrier is sealed, insulation can be blown in

Specification(s):

- Install an air barrier material over entire area to be insulated that will withstand insulation pressures.
- Secure backing material using mechanical fasteners, spaced a maximum of 6" apart, that penetrate the sub framing a minimum of 1" to withstand minimum 3.5 lb/ cubic ft pressure.
- Seal all seams, joints, connections, etc. with a compatible sealant.
- Installation must have a minimum of a 30-year service life.

Objective(s):
Insulate to prescribed R-value

Dense Pack Cellulose Procedure

- Drill hole slightly larger than nozzle into rigid barrier with hole saw
- Dense pack insulation into floor cavities to specified r-value from Work Order
- Fill with cellulose to 3.5lb/density
- Install closure system over all access holes that is airtight and permanent
- Onsite insulation certificate

Band/ Rim Joists - Rigid Insulation

Desired Outcome:
Continuous, contiguous, and safe thermal boundary that prevents air movement @ 50 Pascals

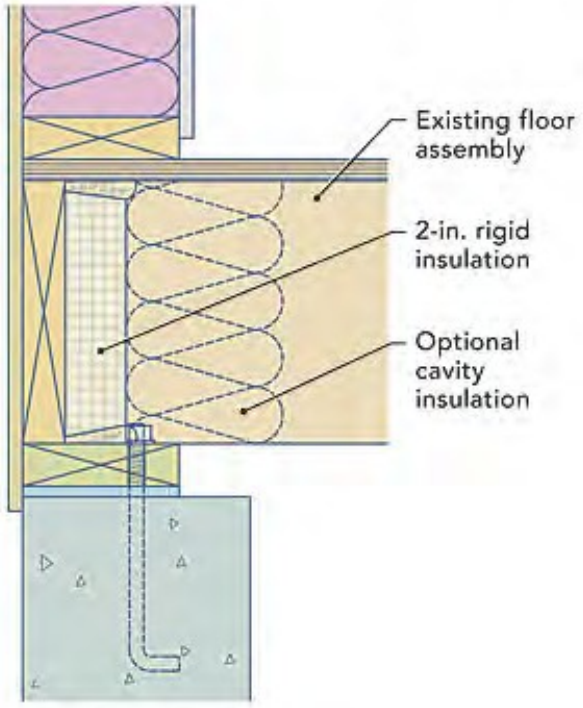
Specification(s):

A foam-based insulation will be installed so as to create a continuous thermal and pressure boundary or vinyl faced fiberglass batt insulation, installed tightly to the wood and sealed at all edges.

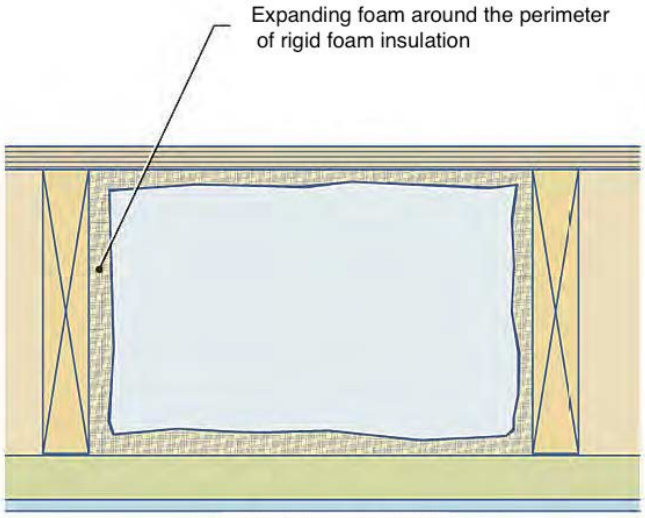
If rigid insulation is used, all edges will be sealed and the insulation will be installed tightly to the wood to prevent the movement of moisture throughout the assembly.

Insulation will be installed in accordance with local/national code requirements and/or manufacturer's instructions regarding flame spread.

Objective(s): Insulate and seal band/rim joist

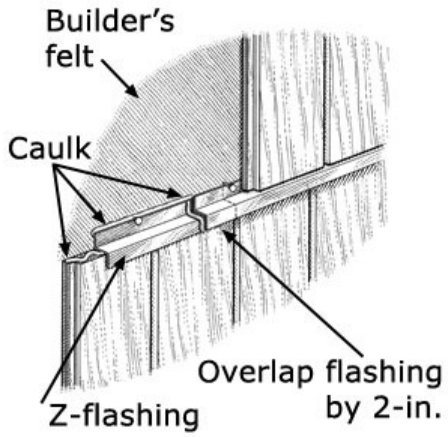


Section



example of rim joist using rigid insulation

Skirting



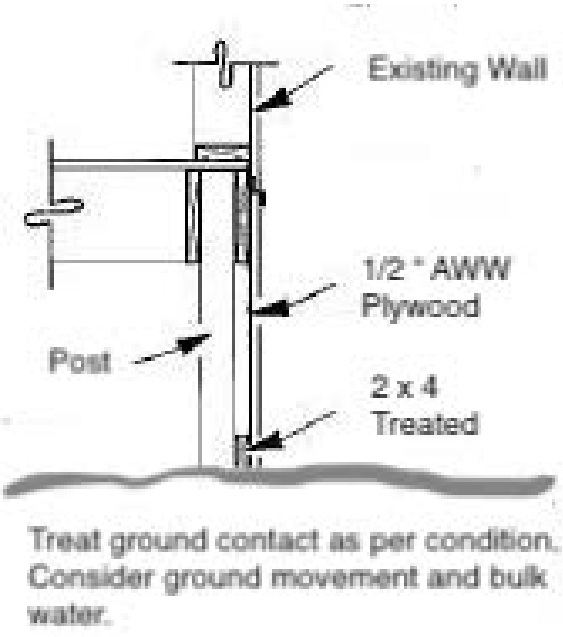
Desired Outcome:
Protective skirting effectively installed to retard damage from natural causes such as wind, water, and pests.

Specification(s):
Any materials making contact with the ground will be rated for ground contact.
Any wood exposed to the elements should be weatherproof. Use z-metal or appropriate flashing to prevent water intrusion at top of flashing and corners.

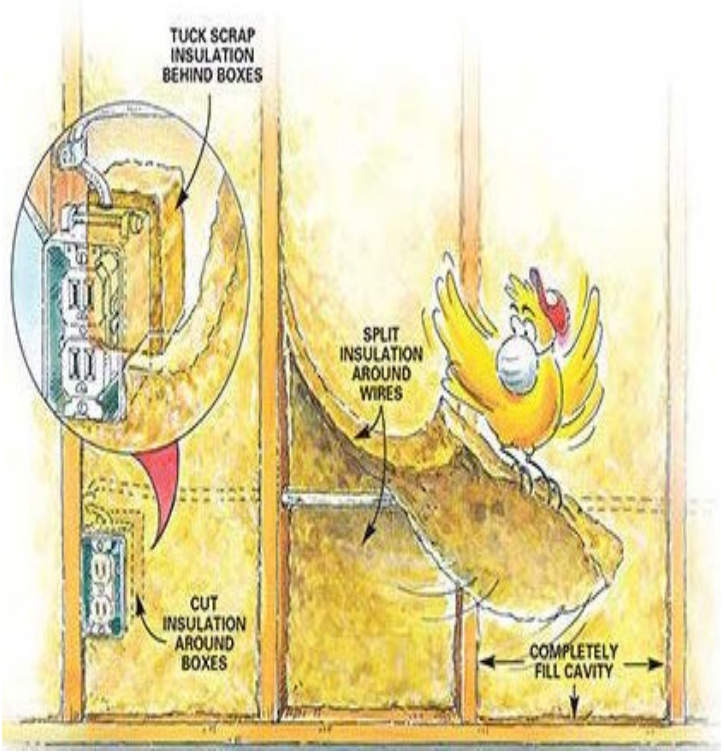
Skirting will be continuous around the perimeter and enclose the entire floor area below the conditioned living space.

Objective(s):
Minimize pests, wind, water, and freezing of pipes under house

Examples



Wall Batt Insulation



Desired Outcome
Continuous, contiguous, safe, and compliant thermal boundary that prevents air movement @ 50 Pascals

Pre-work qualifications

Verify that installation area is free of:

- active water leaks,
- fuel leaks (i.e., gas, oil, propane)
- pest intrusions.
- energized knob and tube wiring uncovered electrical junctions.
- improperly terminated devices (ventilation fans, dryers, plumbing stacks, condensate lines, combustion appliance flues/chimneys, supply and/or return air ducts, etc.)
- Unshielded high-temperature devices (non-IC rated recessed lights, chimneys, flues, vents, etc.) unless they are zero clearance devices.
- Insulation escape openings.
- Verify that installation area is intact, able to support insulation weight, and air sealed.

Installation

- Install batt insulation to prescribed R-value in every joist bay in full contact with the air barrier. and all sides of the cavity without gaps, voids, compressions, or misalignments.
- If batt contains a facing material install it in contact with the conditioned space.

Objective

- Continuous and contiguous thermal boundary

Interior Wall Dense Pack

Desired Outcome:
Continuous, contiguous, safe, and compliant thermal boundary that prevents air movement @ 50 Pascals

Specification(s):
Using fill tube, 100% of each cavity will be filled to a consistent density:

- Cellulose insulation used in an enclosed cavity will be installed at 3.5 pounds per cubic foot or greater density.
- Blown fiberglass, mineral fiber, or rock and slag wool used in an enclosed cavity will be installed at or above the manufacturer recommended density to limit air flow that corresponds to an air permeance value of 3.5 cfm/sq. ft. at 50 pascals, the number of bags installed will be confirmed and will match the number required on the coverage chart.

Insulation will be verified to prevent visible air movement using chemical smoke at 50 pascals of pressure difference.

Objective(s):

Complete, consistent, and airtight insulation coverage.

Eliminate voids and settling

Minimize framing cavity air flows

Tools:

1. insulation blowing machine
2. pressure gauge
3. blower door
4. chemical smoke dispenser
5. drill
6. tape measure
7. ladder

Materials:

1. cellulose or fiberglass insulation (any fiberglass material used must be specifically approved for air flow resistance by the manufacturer).
2. wooden, plastic, or foam plugs to fill installation holes.
3. piece of fiberglass batt or towel to stop insulation from blowing out around the hose.

Interior Wall Dense Pack

Calculate the number of bags needed

and verify the number you actually install.

Check that the static pressure at the blowing machine and at the hose end is at least 2.9 PSI.

Adjust the pressure with the blower controls.

Adjust the feed gate to fill an 8-foot wall cavity in 2 to 4 minutes.

With a rag or fiberglass batt to prevent insulation blowing out, fill all cavities in exterior walls with insulation.

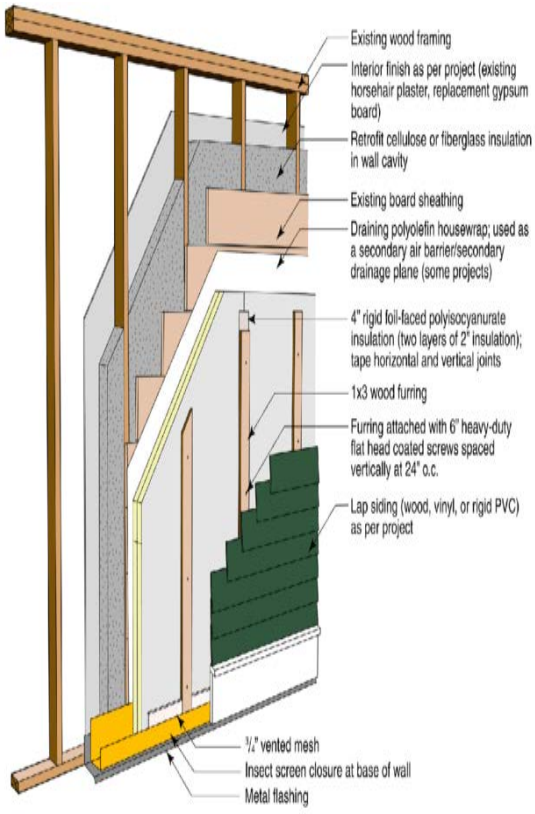
Check to make sure all cavities are properly filled. One of these is empty, and another is not filled to proper density.

Check that cavities are filled and are the proper density.

Check for air leakage reduction after dense-pack insulation using a blower door at -50 Pascals and smoke.

Exterior EPS Retrofit Wall System

Desired Outcome
Durable, weather-proof, and effective, exterior thermal boundary.



Pre-work checklist

Verify that installation area is free of:

- active water leaks, fuel leaks (i.e., gas, oil, propane).
- pest intrusions.
- energized knob and tube wiring.
- improperly terminated devices (ventilation fans, dryers, plumbing stacks, condensate lines, combustion appliance, flues/chimneys, etc.)
- unshielded high-temperature devices (non-IC rated recessed lights, chimneys, flues, vents, etc.) unless they are zero clearance devices.
- insulation escape openings.

Verify

- Installation area is intact, able to support insulation weight, and air sealed.
- Existing building eaves/overhangs will adequately exceed new wall thickness to prevent moisture intrusion.
- Installed panels are above grade as per manufacture's specification.
- Determine if mechanical or utility penetration needs to extended in the installation area.
- Installation area is structurally able to support the weight of added insulation panels.

Installation

- Install panels to prescribed R-value.
- Use fasteners of the proper length and material installing fasteners with correct fastener spacing, a
- Seal all insulation seams, joints and connections in each layer with compatible sealant (caulk, tape, mastic, etc.).

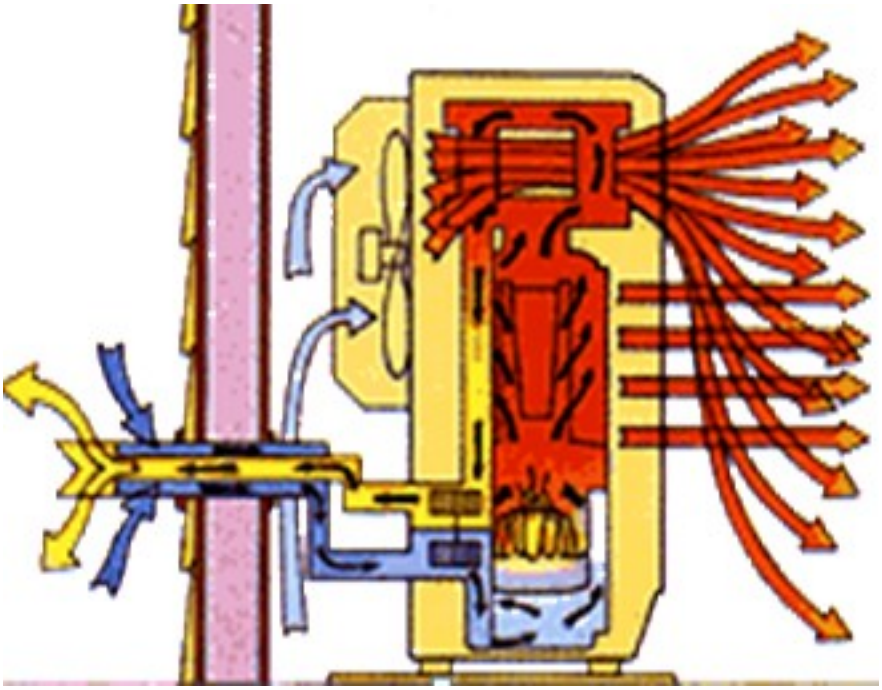
Finishing wall exterior

- Make windows, doors, and other penetrations weather-tight.
- Verify intentional drainage is functioning correctly (do not seal drainage weep holes).
- Verify safe operation of windows and doors.
- Install finish siding according to manufacturer’s specification.

Objective

- Maintain drainage plane while ensuring proper operation of fenestration.

Heating and Cooling

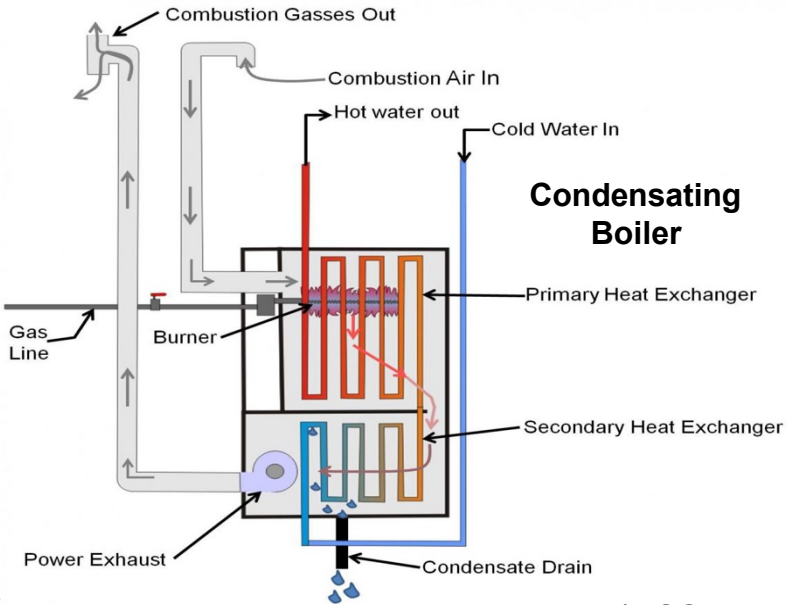


Boilers Install

Desired Outcome

Safe, efficient, compliant, and effective system installation,

in which sequence of operation is correct.



Load calculation

Specification

- Perform residential load calculation in Manual J (Residential Load Calculation) or equivalent using interior design temperatures of 70 degrees for heating, (for Alaska, equivalent is Akwarm).
- Calculated loads based on post-retrofit dwelling characteristics including distribution system.

Objective

Equipment design load calculated correctly for post-retrofit dwelling.

Equipment selection

Specification

- Select residential equipment in accordance with the current version of ANSI/ACCA Manual S (Residential Equipment Selection) or equivalent.
- Select commercial equipment in accordance with the current version of ANSI/ACCA Manual CS (Commercial Applications, Systems and Equipment) or equivalent.
- Select heating equipment of the lowest capacity required to meet the design heating load and provide sufficient volume for components of existing distribution system that will not be replaced.
- Select system that is ENERGY STAR certified or equivalent

Objective

Select efficient equipment capable of meeting the design load

Equipment installation

Specification

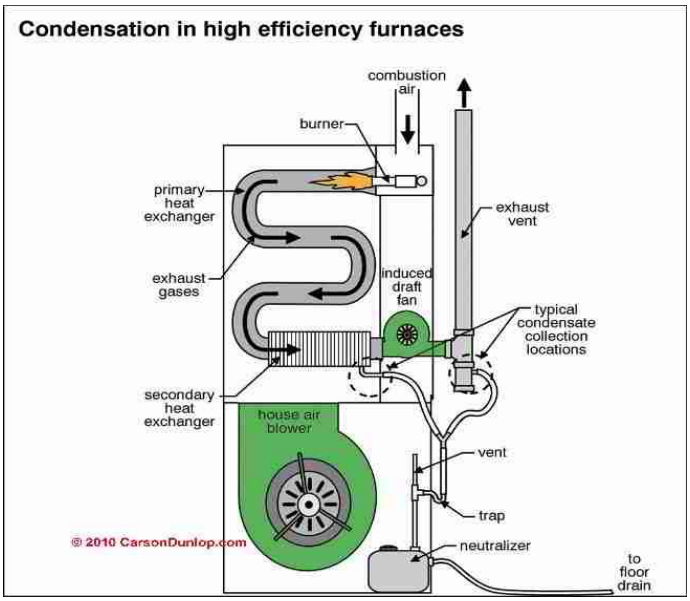
- Install boiler according to manufacturer specifications and applicable building code (e.g., IRC, IMC, IBC).
- Install fuel delivery to the unit according to SWS Subtopic "Fuel Delivery".

Objective

Safe and compliant installation with safe and durable fuel supply.

Furnaces Install

Section: Heating & Cooling
Topic: Forced Air
SubTopic: Equipment Installation



Desired Outcome
Safe, compliant, efficient, and effective system installation in which sequence of operation is correct

Equipment selection

Specification

Select residential equipment in accordance with the current version of ANSI/ACCA Manual S (Residential Equipment Selection) or equivalent (for Alaska, equivalent is Akwarm)

Select commercial equipment in accordance with the current version of ANSI/ACCA Manual CS (Commercial Applications, Systems and Equipment) or equivalent.

Select heating equipment of the lowest capacity required to meet the design heating load and provide the air movement required by any air conditioning equipment installed.

Select system that is ENERGY STAR certified or equivalent .

Objective
Select efficient equipment capable of meeting the design loads.

Indoor unit location

Specification

Locate unit in a dry location and within conditioned space (when feasible) that provides adequate service access according to manufacturer specifications and applicable code.

Objective
Protect unit from corrosion and thermal loss and facilitate service access

Indoor unit installation

Specification

Install indoor unit according to manufacturer specifications and applicable building code (e.g., IRC, IMC, IBC) and ANSI/ACCA Standard 5 (HVAC Quality Installation Standard)

Objective
Safe, accessible, stable, and properly installed indoor unit with safe and durable fuel supply

Support - all installations

Specification

Ensure unit is level, stable, secured to ductwork, properly braced to prevent movement (seismic bracing), and elevated as required by applicable building code

Objective
Safe, stable, and durably supported indoor unit

Mini-Split System

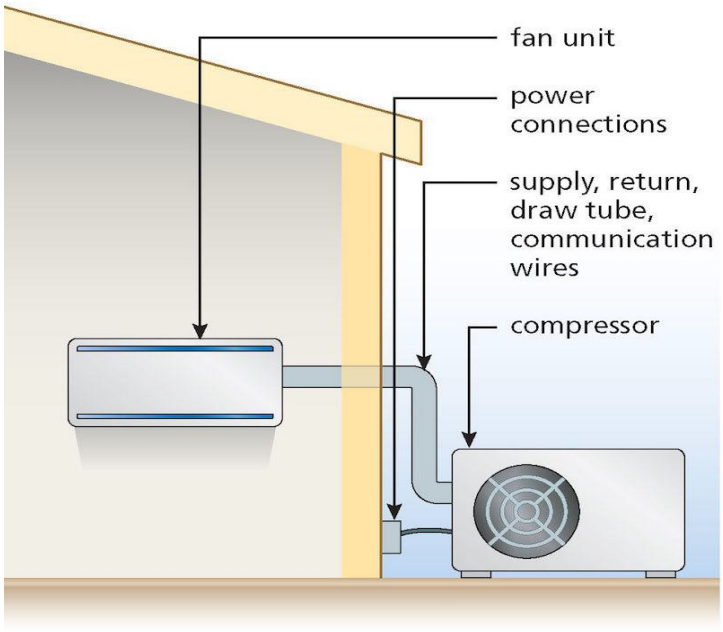
Section: Heating & Cooling

Topic: Forced Air

SubTopic: Equipment Installation

Desired Outcome

Safe, compliant, efficient, and effective system installation in which sequence of operation is correct



DUCTLESS MINI SPLIT HEAT PUMP

5.0108.3a Load calculation

Specification

Perform residential load calculation in accordance with the current version of ANSI/ACCA Manual J (Residential Load Calculation) or equivalent (Akwarm accepted in Alaska) using interior design temperatures 70 degrees for heating.

Perform commercial load calculation in accordance with the current version of ANSI/ACCA Manual N (Commercial Load Calculation) or equivalent using interior design temperatures 70 degrees for heating.

Room by room load calculations will be performed when installing multiple indoor units.

Calculated loads based on post-retrofit dwelling characteristics.

Objective

Equipment design load calculated correctly for post-retrofit dwelling.

5.0108.3b Equipment selection

Specification

Select residential equipment in accordance with the current version of ANSI/ACCA Manual S (Residential Equipment Selection) or equivalent Akwarm accepted in Alaska.

Select commercial equipment in accordance with the current version of ANSI/ACCA Manual CS (Commercial Applications, Systems and Equipment) or equivalent.

Select system that is ENERGY STAR certified or equivalent.

Select outdoor units that are corrosion-protected for marine climate zones.

When applicable, supply multiple indoor units with a single outdoor unit using manufacturer specifications to determine allowable overage of indoor unit capacity in relation to the outdoor unit and derated capacity of indoor units based on outdoor design temperature.

When applicable, select units that offer ducting options (e.g., ceiling cassette units have a knock out for a 5" or 6" duct) and/or have an outdoor air intake.

Objective

Select equipment capable of meeting the design loads .
Equipment operates at optimal efficiency and reduced cost .

Solid Fuel Heating Wood or Pellet Stove

Desired outcome:
Efficient, safe, and compliant heating system installation

Pre-work qualifications

- Certify that the location chosen for installation will provide sufficient clearances, access, combustion air, and egress as required by the manufacturer's instructions, local codes, and NFPA 211A 211.
- If conflicts exist between installation standards, the more restrictive provisions will apply.

Design

Specifications:

- Perform residential load calculation in accordance with the current version of ANSI/ACCA Manual J (Residential Load Calculation) or equivalent (AkWarm)using interior design temperatures of 70 degrees for heating.
- Calculate load based on post-retrofit dwelling characteristics.
- Calculate combustion air needs in conformance with NFPA 211 and manufacturer requirements.

Installation

Specifications:

- Install unit per manufacturer specifications, in accordance with applicable codes and with the current NFPA 211.
- Ensure unit is level and stable.
- Install dedicated outside air kit per manufacturer instructions.

Objective
Safe and compliant installation

Disposal

Specification
Permanently decommission old equipment, remove from job site, and recycle or dispose of as required by local codes or regulations.

Combustion Air - Fuel-Fired Appliances

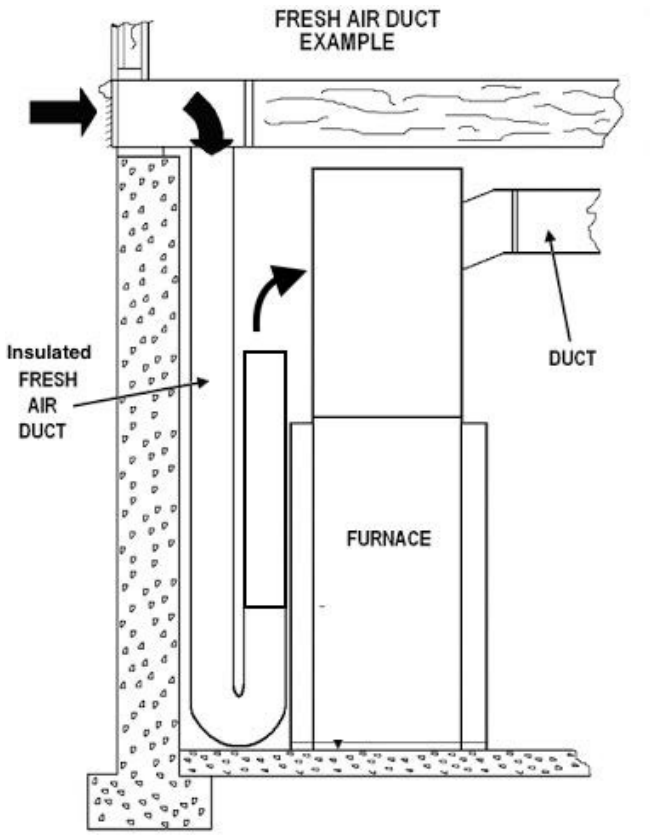
Desired outcome:
Buildup of dangerous combustion byproducts in the living space prevented.

Specification:
Where applicable, combustion air will be provided from the outside and installed in accordance with the 2012 IRC for the type of appliance installed.

Objective(s):
Prevent combustion byproducts from entering the house.

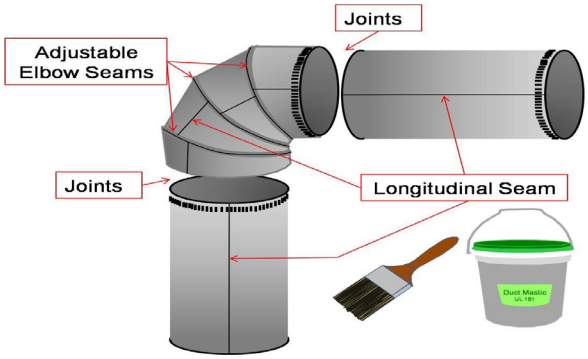
When adding combustion air consider:

- Exterior intake location for wind effect and climate
- Interior air outlet location to not have freezing wind washing on plumbing pipes



Duct Sealing

Sealing Small, Medium & Large Holes



Specification
Seams, cracks, joints, holes, and penetrations less than ¼" will be sealed using UL 181 fiber-embedded mastic.

Seams, cracks, joints, holes, and penetrations between ¼" and ¾" will be sealed in two stages:

* They will be backed using temporary tape (e.g., foil tape) as a support prior to sealing
* They will be sealed using fiberglass mesh and mastic.

Seams, cracks, joints, holes, and penetrations larger than ¾" will be repaired using rigid duct material.

Mastic will overlap repair joint or existing temporary tape by at least 1" on all sides.

Objective:
Eliminate air leakage into or out of ducts and plenums.

Ensure adhesion of primary seal (fiberglass mesh and mastic) to the duct.

Reinforce seal

Support fiberglass mesh and mastic during curing.

After gaining access to the leakage site, choose the appropriate sealing technique from below. Each of these step-by-step groupings illustrate a specific sealing technique based on the hole size.

There are 3 sets to choose from:

Duct Sealing Small Holes (1/4" or less)

Seams, cracks, joints, holes and penetrations that are 1/4-inch or less

Seal with mastic.

Sealing Medium Holes

STEP 2: Install temporary tape over seams, cracks, joints, holes and penetrations.

STEP 3: Apply a base coat of mastic to completely cover and extend beyond tape.

STEP 4: Apply fiberglass mesh tape to completely cover and extend beyond mastic.

STEP 5: Apply a second coat of mastic atop fiberglass mesh tape to completely cover and extend beyond tape.

Notes:
Temporary tape can be a variety of different types of tape. It is used to prevent mastic from falling into the hole and should only be used if also using mesh tape for reinforcement.

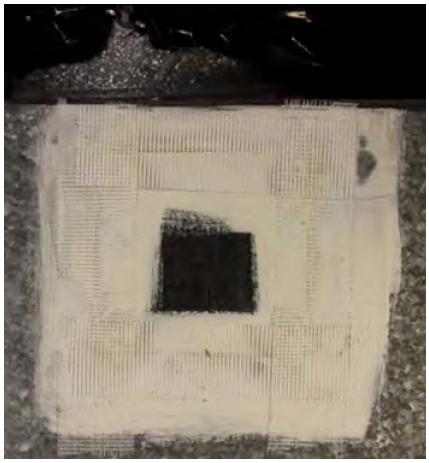
Sealing Large Holes

STEP 1: Seams, cracks, joints, holes and penetrations that are larger than 3/4-inch.

STEP 2: Install rigid duct support material that is at least 1 inch larger than the hole.

STEP 3: Apply a base coat of mastic to completely cover and extend beyond support material.

STEP 4: Apply fiberglass mesh tape to completely cover and extend beyond mastic.



STEP 5: Apply a second coat of mastic atop fiberglass mesh tape to completely cover and extend beyond tape.

Duct Sealing Large Holes in Plenum

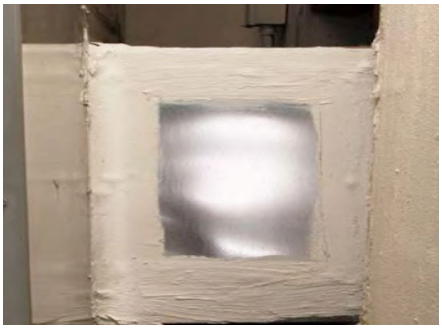
STEP 1: Seams, cracks, joints, holes and penetrations that are larger than 3/4-inch.

STEP 2: Install rigid duct support material that is at least 1 inch larger than the hole.

STEP 3: Apply a base coat of mastic to completely cover and extend beyond support material.

STEP 4: Apply fiberglass mesh tape to completely cover and extend beyond mastic.

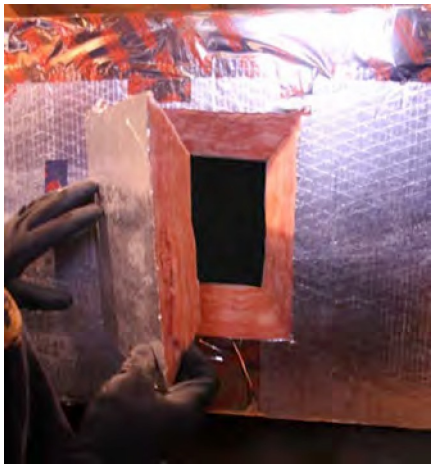
STEP 5: Apply a second coat of mastic atop fiberglass mesh tape to completely cover and extend beyond tape..



Sealing Large Holes in Duct Board

STEP 1: Seams, cracks, joints, holes and penetrations that are larger than 3/4-inch.

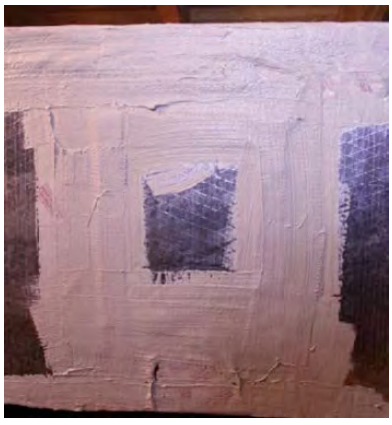
STEP 2: Install rigid duct support material that is at least 1 inch larger than the hole.



STEP 3: Apply a base coat of mastic to completely cover and extend beyond support material.

STEP 4: Apply fiberglass mesh tape to completely cover and extend beyond mastic.

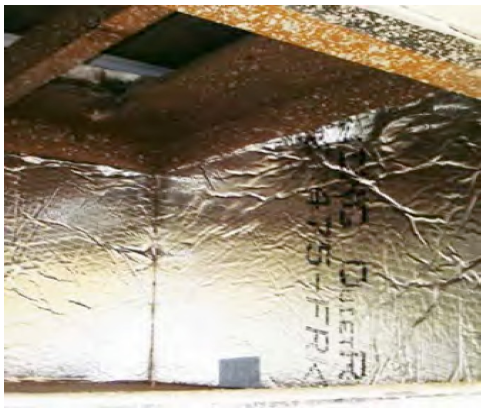
STEP 5: Apply a second coat of mastic atop



Duct Sealing Return Platform Plenum

STEP 1: Seams, cracks, joints, holes and penetrations that are larger than 3/4-inch.

STEP 2: Install rigid duct support material that is at least 1 inch larger than the hole.



STEP 3: Apply a base coat of mastic to completely cover and extend beyond support material.

STEP 4: Apply fiberglass mesh tape to completely cover and extend beyond mastic.

STEP 5: Apply a second coat of mastic atop fiberglass mesh tape to completely cover and extend beyond tape.

Duct Support

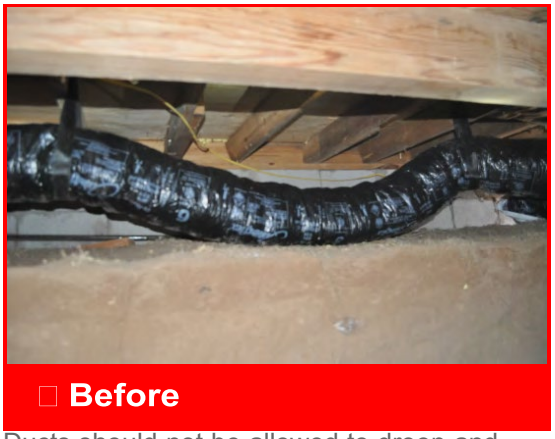
Desired Outcome:
Ducts and plenums properly supported

Specification(s):
Flexible and duct board ducts and plenums will be supported every 4' using a minimum of 1 ½" wide material.

Support materials will be applied in a way that does not crimp ductwork or cause the interior dimensions of the ductwork to be less than specified (e.g., ceiling, framing, strapping); duct support must be installed in accordance with authority having jurisdiction.

Metal ducts will be supported by 1/2 inch wide eighteen gauge metal straps or 12-gauge galvanized wire at intervals not exceeding 10 feet or other approved means.

Objective(s):
Eliminate falling and sagging



Ducts should not be allowed to droop and drag, adding distance to run.

Properly supported ducts minimize heat loss and maximize air flow.

Support for Horizontal, Suspended Ducts

Flexible and duct board ducts and plenums will be supported where feasible in accordance with flex duct manufacturer specifications and local codes.

Support materials will be applied in a way that does not crimp ductwork or cause the interior dimensions of the ductwork to be less than specified (e.g., ceiling, framing, strapping).

Metal ducts will be supported by metal strapping, rods, or other materials, where feasible.

Duct Support (applies to all duct types)

BAD: Make sure supports DO NOT compress insulation or duct

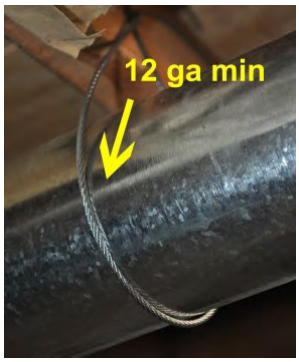
Flex ducts should have supports no

less than every 4 feet

Durable strap should be at least 1 1/2 inches wide

Metal ducts should be supported every 10 feet or less with straps or wire

Metal straps should be at least 18 gauge and 1/2 inch wide



Metal wire should be at least 12 gauge and galvanized

Sealing Flex Duct to Plenum

Peel back outer layer of insulation, seal plenum with mastic using appropriate sealing technique based on hole size.

Install nylon tie band around inner liner using a tie band tensioning tool.

Seal inner liner with mastic. choose the appropriate sealing technique based on hole size.

Replace outer liner and insulation.

Install nylon tie band around outer liner using a tie band tensioning tool.

Duct Boot Sealing

Desired Outcome:
Ducts and plenums sealed to prevent leakage.

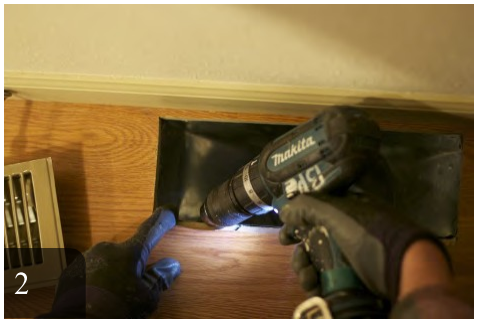
Specification(s):
All gaps between boot and interior surface that defines conditioned space will be air sealed.

Gypsum edge will be wetted before applying water-based sealant .

Sealants will be continuous and be in accordance with 2012 IRC R302.9.

Objective(s): Prevent air leakage and a fire hazard.

Remove grill to expose duct boot and gaps



Use fasteners to close gaps before applying mastic

Wet the edges of the drywall to ensure a good bond

Cut mesh to fit around duct boot and cover gaps

Apply mastic over tape to create heat resistant, durable bond, allow to dry

Once mastic is set, grill can be replaced and mastic should not show

Sealing Air Handler Cabinet

Desired Outcome:
Ducts and plenums sealed to prevent leakage

Specification(s):
Joints will be closed and cracks and holes not needed for proper function of unit will be sealed using removable sealant (e.g., foil tape) or in accordance with the original equipment manufacturer directions (if available).

Objective(s):
Reduce air leakage while maintaining accessibility.

Unnecessary holes in the air handler cabinet need to be sealed

Use removable foil tape to seal holes

Sealing Filter Slot

Desired Outcome:

Ducts and plenums sealed to prevent leakage

Specification(s):
A pre-manufactured or site manufactured durable filter slot cover will be installed.

Objective(s):
Reduce air leakage while maintaining accessibility.

Uncovered filter slots are a point of leakage

Filter slots should be covered

Duct Insulation

Desired Outcome:
Lowered thermal conductance of duct system and minimized condensation on the duct system

Specification(s):
Insulate all ducts outside the thermal boundary to a minimum of R-8

Insulate all ducts exposed to the exterior to a minimum of R-12

Objective(s):
Decrease heat loss and condensation problems

Uninsulated ducts in unconditioned spaces are an energy drain

Properly insulated ducts operate at much higher rates of efficiency


Ducts can be buried in loose fill insulation in attic spaces.

Duct Sealing Before Insulating

Desired Outcome:
Lowered thermal conductance of duct system and minimized condensation on the duct system

Specification(s):
All joint seams and connections in duct or shall be securely fastened and sealed with UL 181 approved tapes, mastics (adhesives) or mastic- plus-embedded- fabric systems installed in accordance with the manufacturer's instructions before insulation is applied

Objective(s):
Minimize duct leakage

Prepare area by assessing any safety concerns

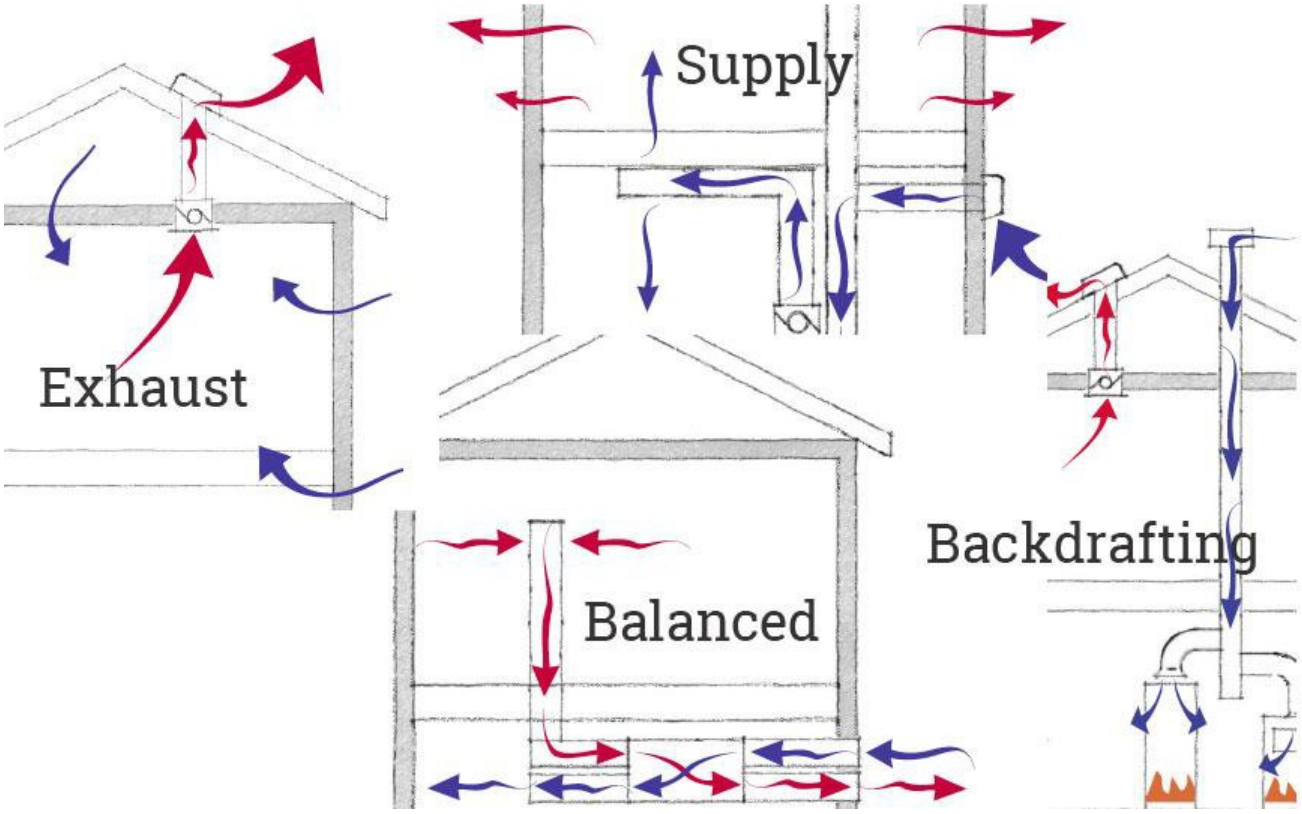
Apply UL 181 mastic or pressure sensitive tapes to seal joint

Large hole greater than 3/4" in duct or .

Install rigid duct support material that at least 1 inch larger than the hole.

Apply mastic to the seams of the patch.

Ventilation Section



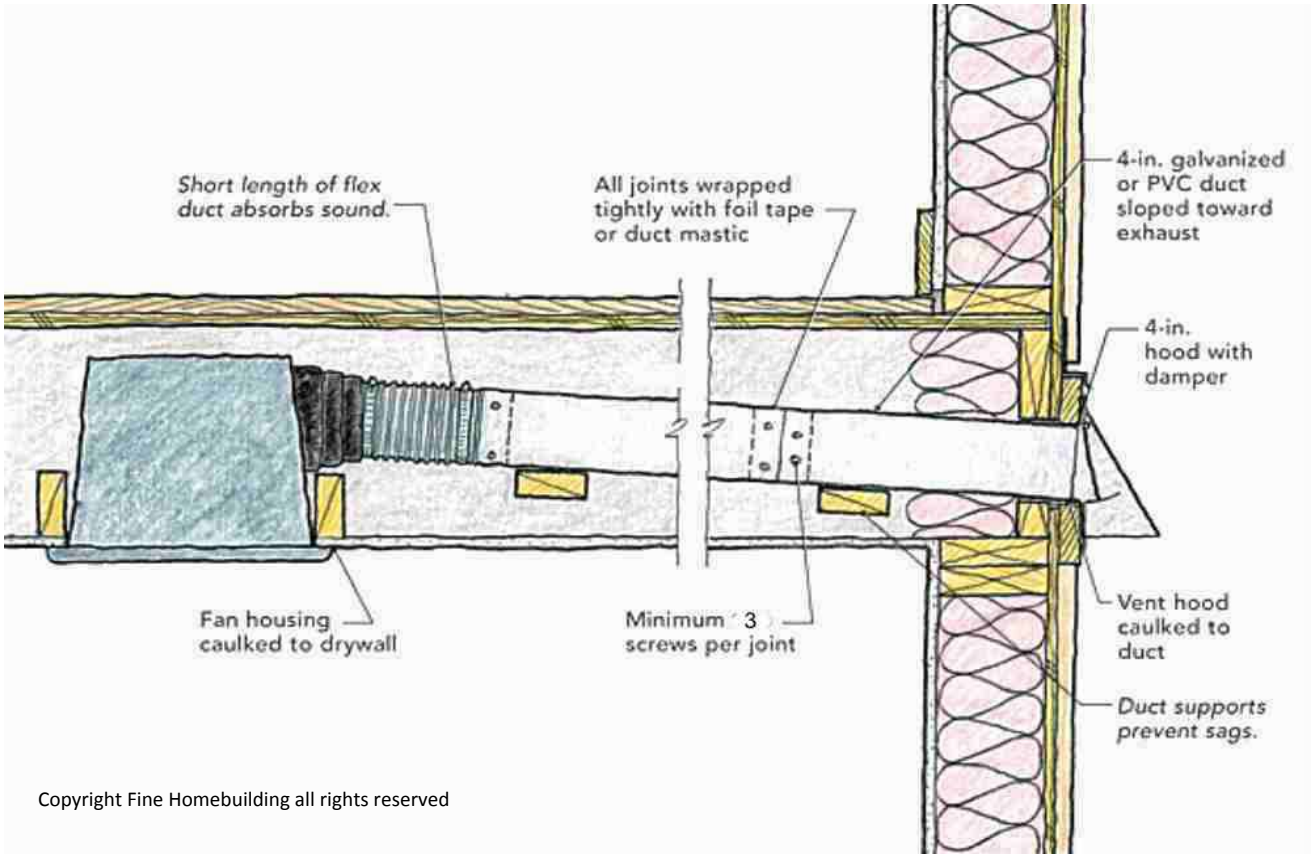
Exhaust Fan Duct Design

Desired Outcome:
Durable, safe, airtight, and effective ventilation ducts that move the required air volume

Specification:
Install ventilation ducts as short, straight, smooth and fully extended as possible Considering the following:

- Vent termination location
- Amount of space for duct run
- Roof condition, type, and access (e.g., metal, shingle, bowstring, flat)
- Choose duct diameter that is equal to or greater than the exhaust fan outlet
- Slope duct downwards towards the termination when possible
- Install flexible duct so the radius at the centerline of any turn is no less than one duct diameter

Objective(s):
Smooth and direct air movement



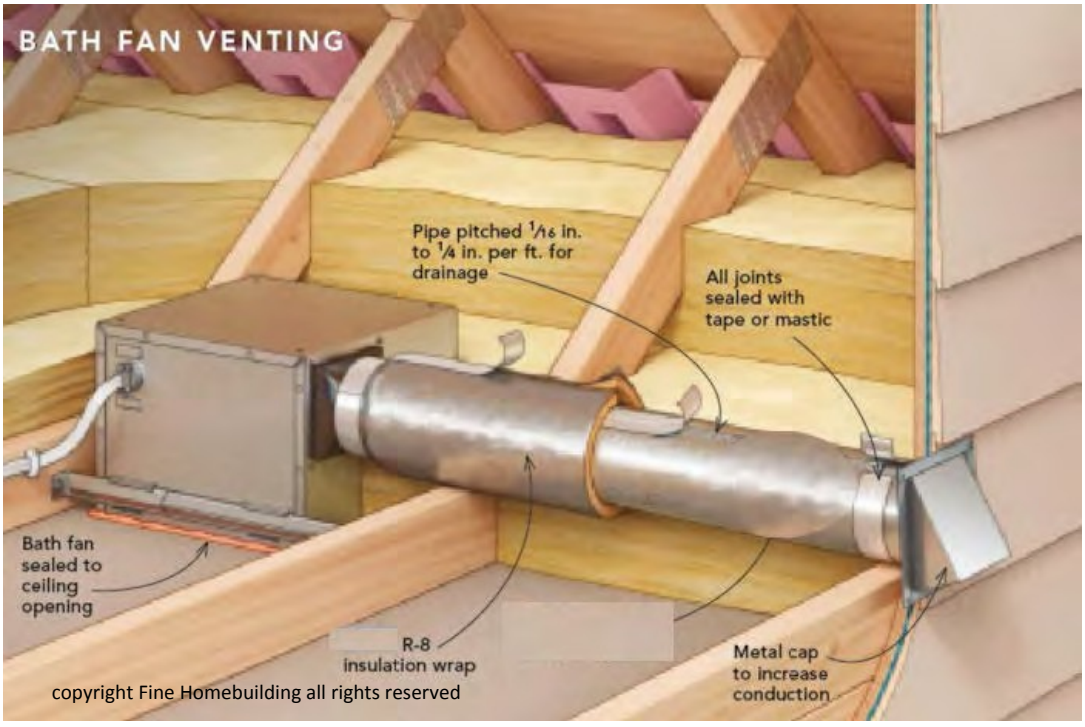
Exhaust Fan Design and Duct Insulation

Desired Outcome:
Installed ducts effectively move the required volume of air and prevent condensation

Specification(s):
Ducts installed outside of the thermal envelope will be insulated to a minimum of R-8

Insulate all ductwork exposed to the exterior of the building to a minimum of R-12

Objective(s):
Prevent condensation from forming or collecting inside of the ductwork



Exhaust fan venting insulation does not require a vapor barrier. Alaska recommends fans be ducted through gable end when practical.

Note:flex-duct shall not exceed 6' feet in length.

Exhaust Termination

Desired Outcome:
Appropriate, safe, weather-tight, pest-resistant, and effective termination fittings with unrestricted air flow.

Specification(s):
Select termination fitting:

- that is appropriate for regional weather conditions and installation location.
- with an integrated collar at least the same diameter as the exhaust duct outlet.
- with an integrated pest screen with holes no less than 1/4" and no greater than 1/2", except for dryer terminations which will have no pest screen.
- for kitchen exhaust: made from galvanized steel, stainless steel, or copper.
- for dryer exhaust: that is designed for dryers exhaust and does not include a pest screen.
- in very cold climates: that have no backflow dampers or use backflow dampers that resist freezing.

Objective(s):

Preserve integrity of the building envelope.

Ensure a weather tight and durable termination installation.

Ensure unrestricted air flow.

6.0101.2a- Kitchen exhaust

6.0101.2b - Backdraft damper

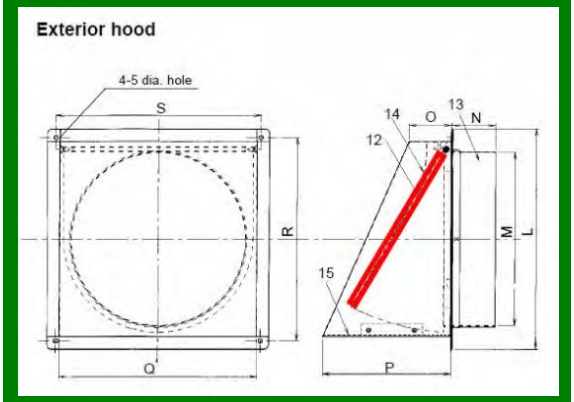
6.0101.2c - Hole in building shell

Kitchen Exhaust Termination

Desired Outcome:
Securely installed termination fittings with unrestricted air flow

Specification(s):
Galvanized steel, stainless steel, or copper will be used for termination fitting for kitchen exhaust.
A backdraft damper will be installed between the outlet side of the fan and the exterior.
A hole no greater than a 1/4 inch greater than the assembly will be cut to accommodate fan assembly.

Objective(s):
Prevent a fire hazard.
Prevent reverse air flow when the fan is off.



Best Practice

Damper should be installed to maintain exterior air barrier

3 1/4 x 9 through wall termination

Kitchen Range Hood

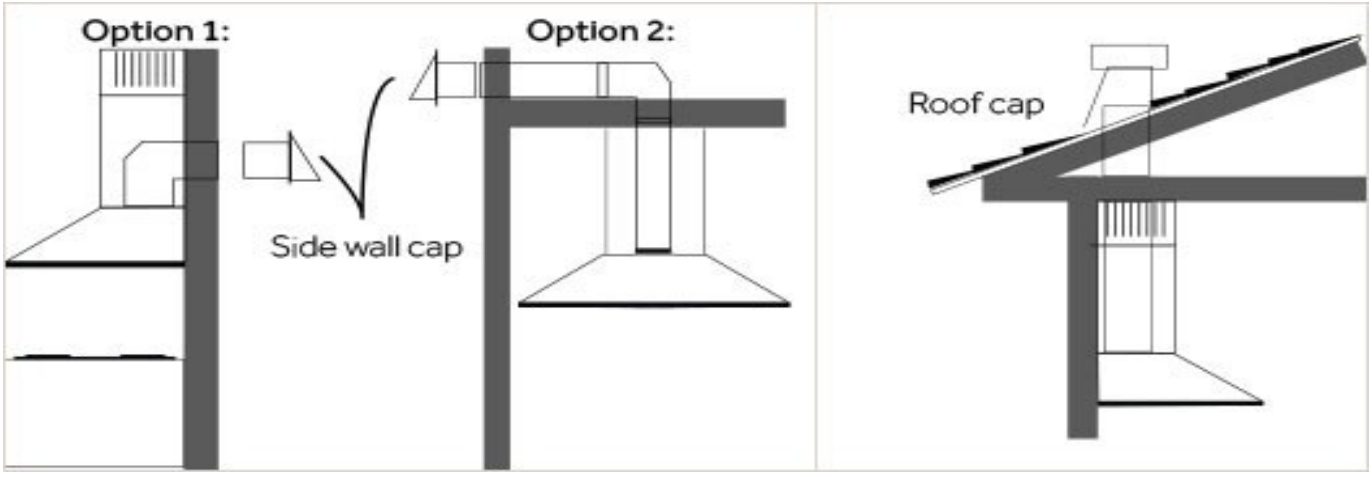
Desired Outcome: Efficient, safe, quiet, and effective removal of air contaminants from kitchens.

Specification(s):

Select a fan that:

- Is rated a maximum of 3 sones at one or more airflow settings greater than or equal to 100 cfm
  Has a minimum efficacy of 2.8 cfm/watt
- Moves at least 100 cfm intermittently or 5 kitchen air changes per hour (ACH) continuously after installation, ducting, and termination is complete
- Kitchen range fans will be vented to the outdoors

Objective:
Efficient and quiet equipment that moves the specified amount of air to exterior



Kitchen range checklist:

- Vent range fans outdoors.
- A short a run as practical of smooth wall metal.
- Ducting securely fastened and sealed with welds, gaskets, mastics or metal tapes.
- Exhaust venting passing through unconditioned space will be insulated to a minimum R-8 and secured with twine or wire.

Clothes Dryer Ducting

Desired Outcome: Dryer air exhausted efficiently and safely

Specification(s):

- Clothes dryers will be ducted to the outdoors, which does not include unconditioned spaces such as attics and crawl spaces that are ventilated with the outdoors.
- As short a run as practical of rigid sheet metal or semi-rigid sheet metal venting material will be used in accordance with manufacturer specifications.
- Dryer ducts exceeding 35' in duct equivalent length will have a dryer booster fan installed
- Plastic venting material will not be used.
- Uninsulated clothes dryer duct will not pass through unconditioned spaces such as attics and crawl spaces.

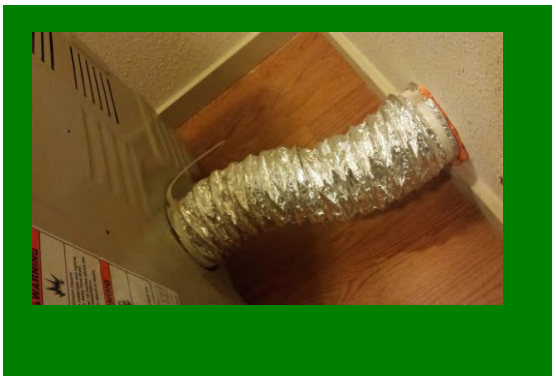
Ducts will be connected and sealed as follows:

- UL listed foil type or semi-rigid sheet metal to rigid metal will be fastened with clamp
- Other specialized duct fittings will be fastened in accordance with manufacturer specification.
- In addition to mechanical fasteners, duct connections will be sealed with UL 181B or 181B-M listed material.

In addition:

- Sheet metal screws or other fasteners that will obstruct the exhaust flow will not be used
- Condensing dryers will be plumbed to a drain.

Objective: Effectively move air from clothes dryer to outside with no damage to building components



Dryer vent transition piece: panduit straps, metal collar at wall, foam air sealing

Clothes Dryer Ducting (cont)

Supported and Insulated dryer vent through unconditioned space. Venting slopes downward toward termination.

Best Practice

In addition Clothes dryer venting installed shall comply with the following:

a. Vent shall terminate in a non-screened vent cap with a damper. The exhaust vent shall terminate not less than 3 feet in any direction from openings into the building.

b. Have a smooth interior finish and shall be constructed of metal a minimum 0.016 inch (0.4 mm) thick. The exhaust vent size shall be 4 inches (102 mm) nominal in diameter.

c. The insert end of the venting shall extend into the adjoining venting or fitting in the direction of airflow.

d. Not exceed 35 feet in length from dryer location to outlet terminal.
The maximum length shall be reduced two and one-half (2.5) feet for every 45 degree elbow and five (5) feet for each 90 degree elbow.

e. Both vertical and horizontal runs shall be supported using nylon, plastic, or metal strapping with a minimum width of ½ inch.

f. Support strapping or hangers shall be installed within one (1) foot of a joint or connection and a maximum of every four (4) feet thereafter.

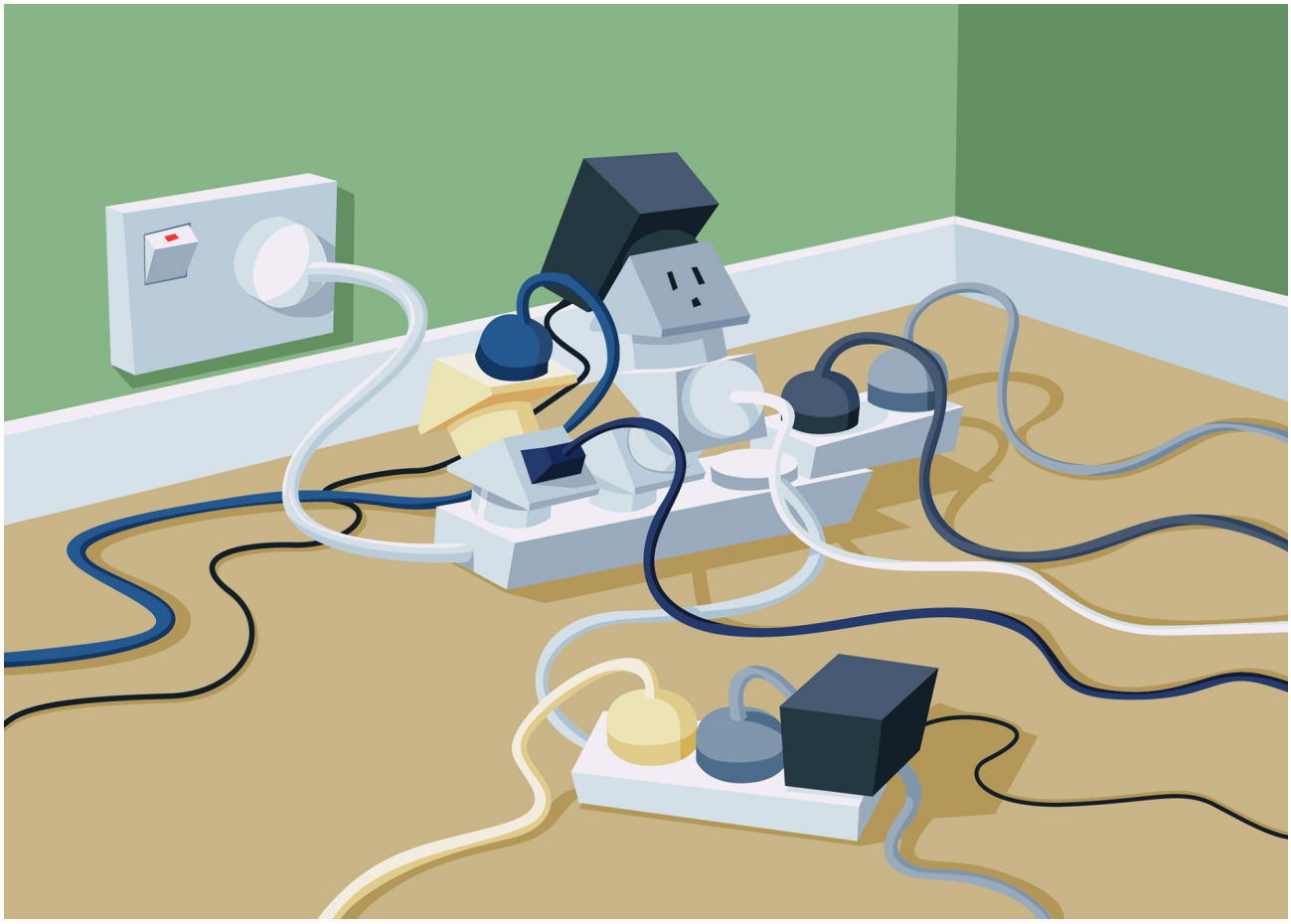
g. Horizontal runs shall be sloped downward toward the vent discharge.

h. Dryer ducting located in unconditioned space shall be insulated to a minimum R- 8.

Dryer transition piece:

- The dryer transition piece is the venting component between the dryer and the point at which it goes through the wall, floor, or ceiling and leaves the vicinity of the dryer.
- This venting shall be listed and labeled in accordance with UL 2158A. The transition piece shall not exceed eight feet in length and be long enough to allow for moving the dryer away from the wall, but not allow excess bending and kinking that can trap lint and water in the venting.
- The flexible transition piece shall not pass through a wall, floor, or ceiling.
- The transition piece shall connect to a smooth metal vent or a metal collar where it penetrates the ceiling, wall, or floor.

Baseload Section



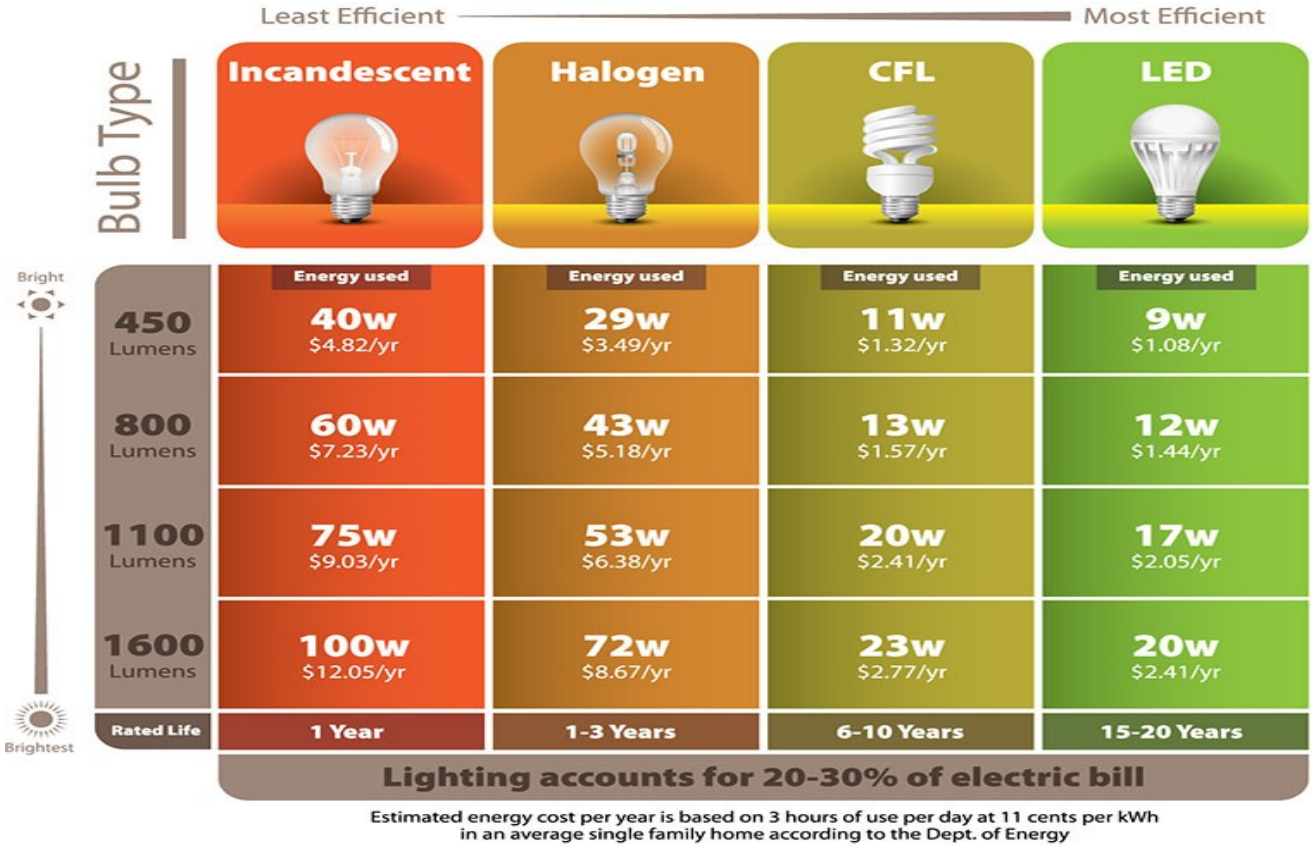
Lighting Replacement

Desired Outcome:
Improved lighting efficacy without performance loss

Specification(s):
Select lighting that is:

- appropriate for the intended application (e.g., enclosed, dimmable, potential for breakage, indoor, and outdoor)
- provide lighting level quality required for the intended application (e.g., task lighting, hazards lighting, nightlights)
- highest level of efficiency within a technology (e.g., LED bulbs)
- ENERGY STAR® qualified, equivalent or better, and UL approved
- facilitate upgrade to future lighting technologies
- rated no more than the rated wattage of fixture

Objective(s):
Select efficient, reliable, and safe lighting improvements



Refrigerator Replacement

Desired Outcome:
Safe, efficient, compliant, and accessible appliance installation

Specification(s):
Select an ENERGY STAR® qualified appliance, equivalent, or better

Select appliance with a minimum one-year warranty that provides a replacement appliance if repeated issues relating to health, safety, or performance occur.

Ensure new appliance will not block access to light switches, cabinets, etc. and will fit through the smallest opening between the outside and installation location.

Objective(s):
Select safe, efficient, and durable appliance

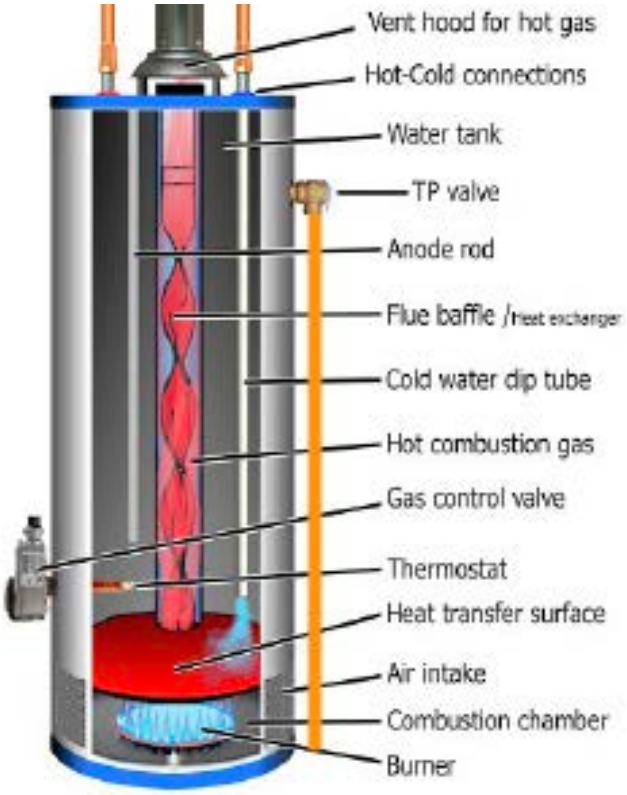
Refrigerator Disposal

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

Permanently decommission old appliance

Objective(s):
Old appliance is permanently removed from service, protect the environment, and comply with regulation.

Fuel-Fired Storage Tank Water Heater



Desired Outcome

Adequate hot water supplied by a leak free,

safe, durable, and accessible water heater.

Pre-work qualifications

- Verify current plumbing infrastructure is sufficient to support the installation and is leak-free.

Equipment selection

- Rated at .70 UEF (uniform energy factor) or better.
- Includes a low nitrogen oxide burner.
- Fits in the installation space with required clearances.
- Provides sufficient hot water for the home and occupants.
- Select efficient, durable, and properly sized water heater.

Location

- Install appliance where it is protected from freezing and accessible for service.
- Install a Temperature and Pressure (TandP) relief valve and pipe the valve to 6" of or less from the floor or drain pan or to the outdoors.
- Install water heater in compliance with applicable code (e.g., IRC, NFPA 31, NFPA 54) and manufacturer specifications.
- If conflict exists between code and manufacturer specifications, apply the more restrictive.

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

Fuel supply

- Install fuel supply components per NFPA 31 (for oil) and NFPA 54 (for gas) and manufacturer specifications.

Shut-off Valves

- Install a separate water cut-off valve for both the hot and cold water lines.

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.

DHW Discharge Temperature

Desired Outcome:
Safe and reliable hot water source provided that meets occupant needs at lowest possible cost of ownership.

Specification(s):
Discharge temperature will be set not to exceed 120° or as prescribed by local code.

Objective(s):
Ensure safe hot water supply temperature to fixtures.

Test temperature of hot water at faucets in house

Hot water temperatures should not exceed 120 degrees Fahrenheit

Adjust water heater settings and insulate as needed

After adjustment and insulation, retest to verify temp is under 120 degrees

Low-Flow Devices

Desired Outcome: Leak-free and safe installation of water saving devices without affecting performance.

Objective(s):
Ensure safe hot water supply temperature to fixtures.

Specification:

- Select showerheads rated for 2.5 gallons per minute (GPM) or less that include an antiscald valve.
- If multiple heads are provided in a shower stall, the total flow rate may not exceed 2.5 GPM.
- Select features that meet any special needs of the occupant (e.g., shut off, swivel, handheld showers).
- Select aerators with a flow rate of 2.2 GPM or less.

Installation:

- Verify adequacy of plumbing and water source.
- Install low-flow devices using a non-hardening thread sealant (i.e., thread tape).
- Install equipment in accordance with manufacturer specifications and applicable building code.

DWH Insulation

Desired Outcome: Safe, reliable, and efficient operation of the appliance maintained

Specification(s):
If additional tank insulation is installed, it will be rated a minimum of R-11 and will be installed to manufacturer specifications.

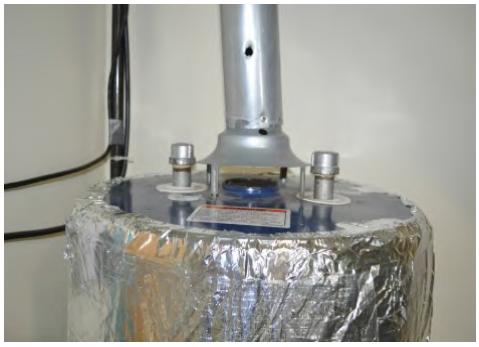
Added insulation will not obstruct the unit's draft diverter, pressure relief valve, thermostats, hi-limit switch, plumbing pipes or elements, and thermostat access plates.

The first 6' of inlet and outlet piping will be insulated in accordance with 2012 IRC N1103.4.2 or local requirements, whichever is greater.

Objective(s):
Reduce standby losses from near tank piping and storage tank.

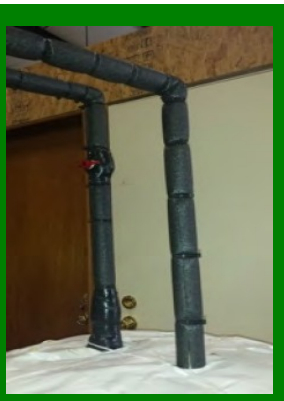
Ensure insulation has 6" clearance from flue gas venting or specified by the manufacturer.

Data plate should still be accessible after wrapping



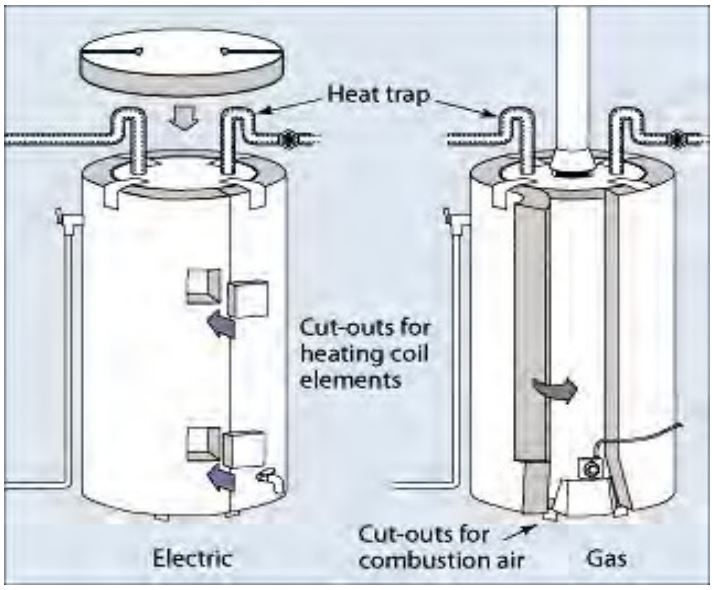
Blanket does not obstruct draft diverter or plumbing pipes and elements

Wrap does not obstruct ventilation, thermostat access plate, hi-limit switch, or fuel line



Best Practice

1st 6 feet of hot and cold water pipes attached to electric water heater insulated with R-3 foam pipe wrap



Roof Interconnected Photovoltaic

Desired Outcome:
Durable, safe, and effective, renewable energy installation

Pre-work verification

- Current electrical panel and service line infrastructure is in good condition,
- Electrical service compliant with codes.
- Sufficient electrical capacity (Amps) to accommodate interconnection of solar power.
- A spare (unused) breaker or space to install new breaker

If a roof installation is planned

- Roof will support the installation (e.g., dead load, wind load)
- Current roof covering is less than 5 years old.
- Type of roof is suitable for solar installation (e.g. not slate or wood shingle)
- Roof understructure shall be inspected and evaluated for support of PV system.
- Any reinforcements,such as blocking between rafters, shall be completed before load of PV system

Objective
Adequate structural and electrical to support PV install

PV System Design

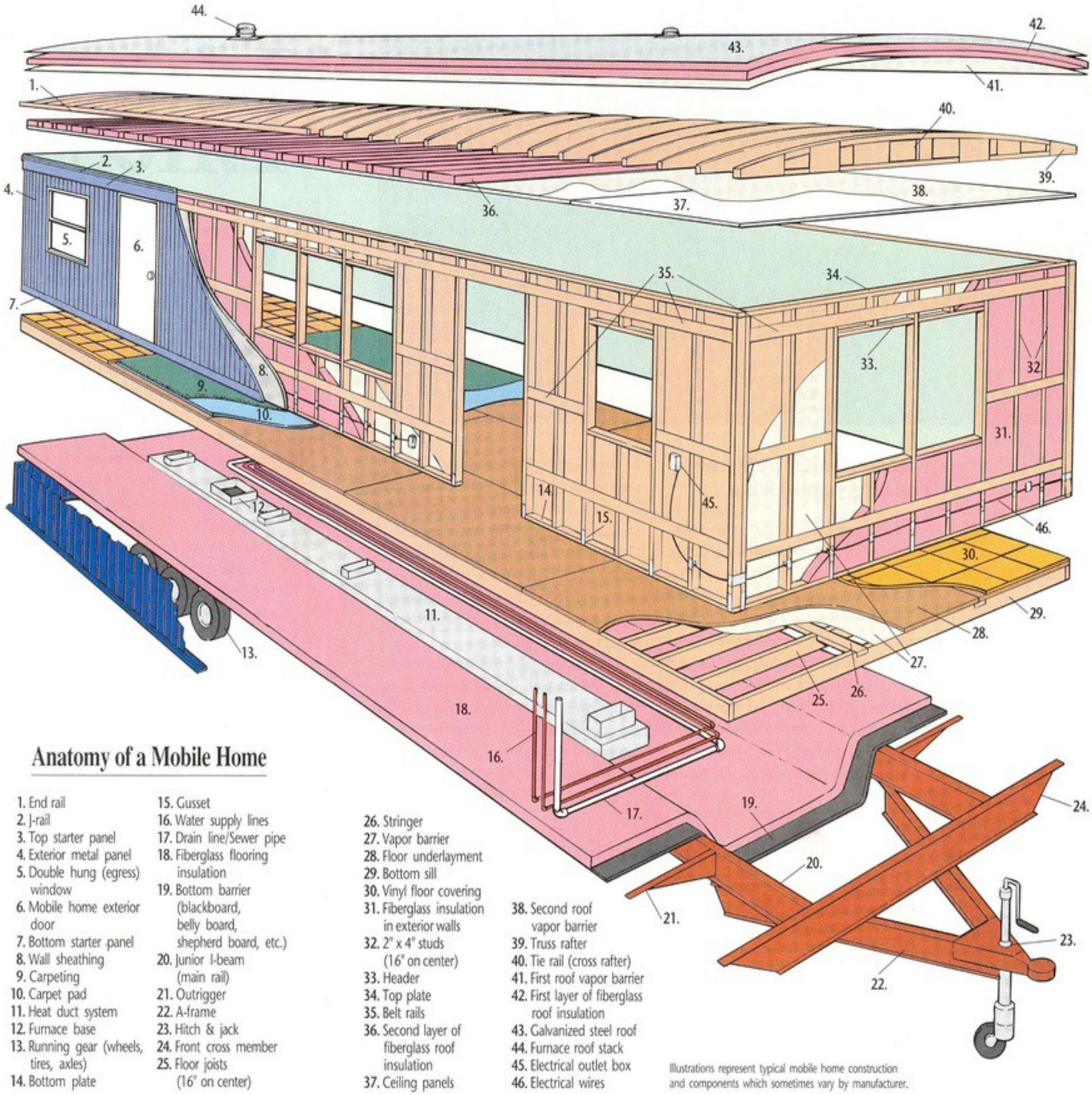
- Size PV system to serve the prescribed load
- Prepare electrical one line drawing
- Prepare layout drawings showing location and connections of all equipment
- Provide list (make, model) of all equipment
- Design PV system layout to provide safe access around PV modules as required by codes and standards
- Clearances around balance-of-system components such as inverter and switchgear
- Locate PV Modules to minimize shading factor and maximize solar gain, but not interfere with existing systems or appliance operation (e.g., chimneys, vents, exhaust terminations)

Objective
Maximize PV system performance

Additional Requirements

- Obtain utility-connected system interconnection agreement
- Obtain required permits for PV installation
- Installer shall meet the requirements of AHJ
- Watertight, safe, wind-resistant, and compliant roof-mounted equipment installation
- System safely accessible for service
- Safely installed interconnected electrical system
- Monitor the system energy delivery for a minimum of 12 months and compare results with predicted energy production

Manufactured Home Section



Anatomy of a Mobile Home

1. End rail
2. J-rail
3. Top starter panel
4. Exterior metal panel
5. Double hung (egress) window
6. Mobile home exterior door
7. Bottom starter panel
8. Wall sheathing
9. Carpeting
10. Carpet pad
11. Heat duct system
12. Furnace base
13. Running gear (wheels, tires, axles)
14. Bottom plate
15. Gusset
16. Water supply lines
17. Drain line/Sewer pipe
18. Fiberglass flooring insulation
19. Bottom barrier (blackboard, belly board, shepherd board, etc.)
20. Junior I-beam (main rail)
21. Outrigger
22. A-frame
23. Hitch & jack
24. Front cross member
25. Floor joists (16" on center)
26. Stringer
27. Vapor barrier
28. Floor underlayment
29. Bottom sill
30. Vinyl floor covering
31. Fiberglass insulation in exterior walls
32. 2" x 4" studs (16" on center)
33. Header
34. Top plate
35. Belt rails
36. Second layer of fiberglass roof insulation
37. Ceiling panels
38. Second roof vapor barrier
39. Truss rafter
40. Tie rail (cross rafter)
41. First roof vapor barrier
42. First layer of fiberglass roof insulation
43. Galvanized steel roof
44. Furnace roof stack
45. Electrical outlet box
46. Electrical wires

Illustrations represent typical mobile home construction and components which sometimes vary by manufacturer.

Air Seal Waterheater Closet

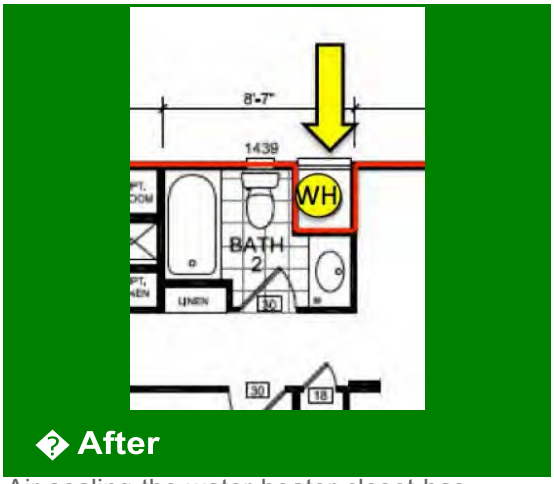
Desired Outcome:
Isolate combustion water heater closet from conditioned space

Specification(s):
When the water heater closet contains a heater that is not sealed combustion or power vented, the closet will be isolated/separated from the rest of the home through air sealing with fire-rated materials, if feasible

Avoiding frozen pipes must be considered without creating an additional utility burden (e.g., heat tape)

Objective(s):
Prevent combustion gases from entering living area and minimize extension of interior pressures caused by exhaust fan, dryers, and interior door closure into the water heater closet

Water heaters that are open combustion must be isolated from the conditioned space by air sealing the closet.



Air sealing the water heater closet has established the pressure boundary around the water heater, isolating it.

Tools:

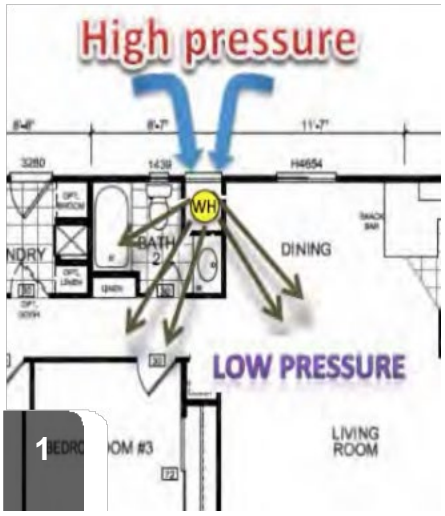
1. Caulk gun
2. Single-component foam gun
3. Manometer, hoses, pressure probes

Materials:

1. Caulk/ foam sealant
2. Water line insulation

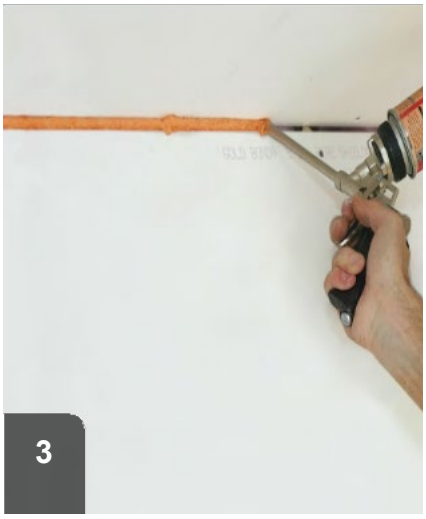
If combustion make-up air is needed for proper combustion appliance operation upon completion of isolating the water heater, refer to Specification 5.0502.1 Combustion Air

Air Seal Waterheater Closet (cont)



Before the water heater closet is isolated, combustion gases can be pulled into the living space.

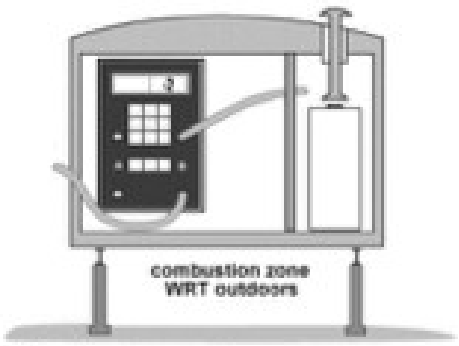
Locate the combustion water heater, determine the materials needed to air seal the closet.



Air seal the water heater closet to eliminate all air pathways from the closet into the living space.

After air sealing the closet, the water heater is isolated from the rest of the house.

Use pressure diagnostics and Alaska combustion safety testing to confirm the appliance operates safely.



Due to limited space in water heater closets, perform pressure diagnostics and combustion safety tests from outside.

MH - Attic Insulation Installation Precheck

Desired Outcome:

Continuous, contiguous, safe, and compliant thermal barrier installation that protects integrity of roof

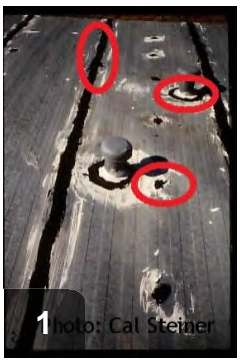
Specification Checklist:

- [ ] All combustion appliance flues will be terminated to the outdoors and terminations will maintain proper clearance above snow loads
- [ ] A distance no less than 3" will be maintained between any combustion appliance flue and combustible materials, unless b-vent is installed which is 1", or zero clearance flue is in place.
- [ ] All ventilation systems will maintain a continuous connection and terminate to the outdoors
- [ ] All broken mushroom vents will be replaced or removed and sealed
- [ ] All plumbing stacks will be terminated to the outdoors
- [ ] Non-IC rated light fixtures will be replaced with air-tight IC-rated fixtures or air-tight damming will be installed around existing Non IC-rated fixture when access allows
- [ ] If replacing, recessed lights will be labeled as having an air leakage rate no more than 2.0 CFM when tested in accordance with ASTM E 283 at a 75 pascals pressure differential.
- [ ] All obvious ceiling penetrations will be sealed.
- [ ] The space between combustion appliance flues and the ceiling will be sealed with fire-rated materials
- [ ] All roof, attic, and ceiling assemblies will be structurally sound; loose ceiling panels will be secured
- [ ] Temporary ceiling bracing will be recommended during the insulation installation process
- [ ] Dishing and pooling of water will be addressed
- [ ] All known roof water leaks will be repaired before insulation installation

Objective(s):

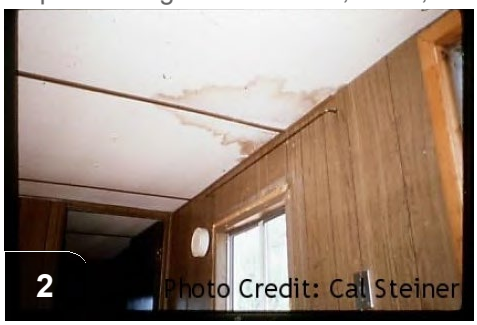
Ensure space can be safely insulated

Mobile Home Roof Cavity Insulation Precheck



Inspect roof for evidence of water pooling, leaks, or damage. Verify proper vent terminations

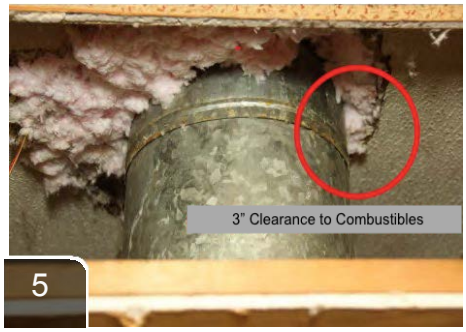
Inspect ceiling for weakness, leaks,



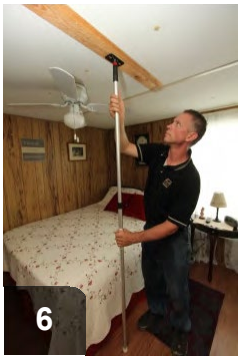
clearance to combustibles, loose panels, and penetrations

Verify presence of rain caps on all vents

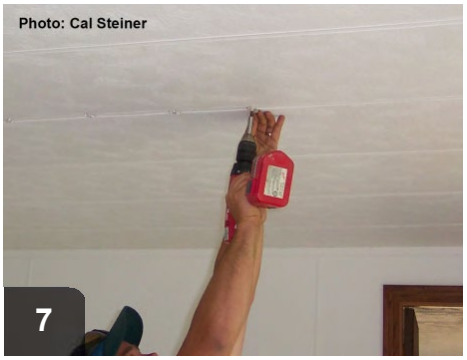
Inspect all patches and repairs, and correct deficiencies if necessary



Verify at least 3" clearance to combustibles, unless flue is labeled and listed for less. Repair if needed



Use temporary supports to avoid ceiling collapse during insulation install



Add fasteners wherever needed to firmly attach ceiling to the trusses

Investigate all water stains and sources of moisture. Repair before insulating the attic

After opening the roof edge, verify proper clearance to combustibles and inspect vent connections

Mobile Roof Attic Cavity Access

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space

Specification Checklist:

☐ Access to the attic cavity will be created using one of these methods:

- Drilling
- Cutting
- Continuous slicing along the center line (at the highest point of the roof)

☐ Access location will be placed to allow for consistent and uniform coverage of installed insulation throughout the attic assembly

☐ There will be, at a minimum, one opening between each roof truss

☐ Openings will be large enough to accommodate the chosen fill tube

☐ If subsheathing is present, access will be gained through subsheathing

☐ Attic will be visually inspected for the location of existing insulation, wiring, flues, obstructions, hazards, and construction type

Objective(s):
Create access to the full attic cavity

Maintain the integrity of the roof truss

Protect roof from wind damage during installation

Determine technique for installing insulation

In Progress

Manufactured home attic cavity accessed by cutting through roof.

Mobile Roof Attic Cavity Access (cont)

Determine and mark truss locations on roof, and choose method of access. Avoid drilling or sawing into trusses

Cut a hole into each truss cavity, big enough to inspect the opening and admit the fill tube

Regardless of access method, visually inspect attic for existing insulation, wiring, flues, obstructions, and hazards

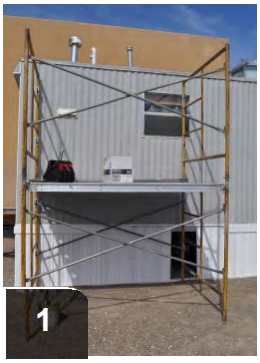
Another option: cut the roof open along the highest point from end to end. Make crosswise cuts at each end if needed

Locate the ceiling level and truss framing prior to drilling through gable siding.

Gable end attic access: when the manufactured home has partial vaulted ceilings or a compromised roof, access may be gained through the gable ends for the flat ceilings. Gable end access requires patching the siding with sheet metal, siliconized caulk, and optional vent cover to conceal patch.

Always use hand protection when working with metal edges and/or sharp tools.

Mobile Home Roof Attic Cavity Access



Ensure a safe work environment by setting up scaffolding. Work in manageable sections

Remove fasteners from the J-channel

Cut through putty tape and pry J-channel away from roof seam

Work in manageable sections to minimize roof damage. One section of J-channel is a long enough area

Remove staples as necessary to lift roof and inspect underneath

Place blocks to lift roof and enable inspection of roof cavity for obstructions and other concerns

Work in small sections to minimize flexing of roof and risk of wind damage

Once visual inspection has shown roof cavity to be viable, begin blowing insulation

Mobile Home Attic Fiberglass Blown Insulation Installation

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space

Specification Checklist:

- [ ] Insulation will be installed to a density of 1.5 to 1.6 pounds per cubic foot
- [ ] Using fill tube, 100% of each cavity will be filled to a consistent density
- [ ] Fill tube will be inserted within 6" of the end of each attic cavity
- [ ] Insulation will be installed into the void of the attic cavity:
  - If existing insulation is roof-mounted, insulation will be blown below
  - If existing insulation is ceiling-mounted, insulation will be blown above
  - If existing insulation is mounted at both locations, insulation will be blown in between
- [ ] Avoid overfilling of roof edges and above attic trusses
- [ ] Flame spread and smoke-developed index for insulation will be a flame spread rating of 25 or less and a smoke development rating of 450 or less when tested in accordance with ASTM E84

Objective(s):

Fill entire attic cavity to the prescribed R-value to reduce air infiltration

Avoid clogging of the cavity and the fill tube

Prevent damage to the ceiling

Allow roof to be returned to original position

Fire safety will be maintained

In Progress


In Progress

Mobile Home Roof Reattachment

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space.

Specification Checklist:

- [ ] If existing J channel is damaged, it will be replaced.
- [ ] Existing sealant will be removed from the roof edge and J channel.
- [ ] At a minimum, new sealant will be reinstalled at the original location.
- [ ] Roof and J channel will be fastened to the original location with new screws.
- [ ] All seams, edges, and penetrations will be sealed as necessary.

Objective(s):
Prepare roof edge and J channel for reattachment

Reattach roof edge and J channel without leaks

If J-channel is salvageable, clean thoroughly before applying putty tape

Apply putty tape to new or reused J-channel to seal roof seam

Using new fasters, attach J-channel along roof seam and seal as necessary

MH Roof Patching and Sealing Openings

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space

Specification(s):
If the roof is sliced:

A solid metal ridge cap will be centered over the slice

- A flexible and durable sealant will be sandwiched between the roof and the ridge cap
- Screws will be installed to prevent wrinkles and create a permanent seal
- Screws will not go into any wood framing
- A durable and flexible final coating will be applied over the screws and edge of the ridge cap to create a continuous seal between the roof and the perimeter of the ridge cap

For holes that are drilled or cut, the initial patch will be applied using the following procedure:

- At least 6" of surface surrounding the opening will be cleaned before patch is installed
- Sealant will be continuous and applied in between the patch and the roof
- Sealant will be an all-weather adhesive that is flexible and durable

If a metal patch is used:

- Patch will overlap the opening by 2" on all sides
- Gauge will be equal to or greater than the roof material
- Fasteners will be installed to prevent wrinkles and create a permanent seal
- If a plug is used, it will be flanged and have a tight fit
- Screws will not go into any wood framing

A durable and flexible 45 mil adhesive patch will be applied in accordance to manufacturer specifications over the initial patch and will have at a minimum:

- Tear strength of 640g
- Elongation of 380%
- Application temperature no lower than 55°F and no greater than 110°F
- Services temperature no less than -25°F and no greater than 150°F
- Adhesive patch will overlap the initial patch by 2" on all sides
- A durable and flexible final coating will be applied over the adhesive patch to create a continuous seal between the roof and the perimeter of the patch
- All remaining seams, edges, and penetrations will be sealed as necessary

Objective(s):
Effectively patch and seal all openings

MH Roof Patching and Sealing Openings (cont)

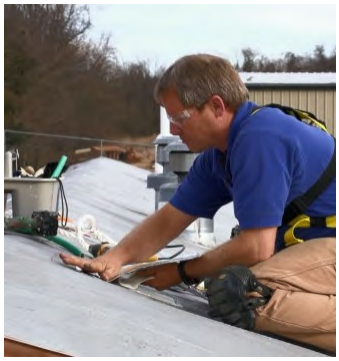
Insert 6" plug and seal around the perimeter of the opening.

Firmly push the plug into place, until it is flush with the roof surface.

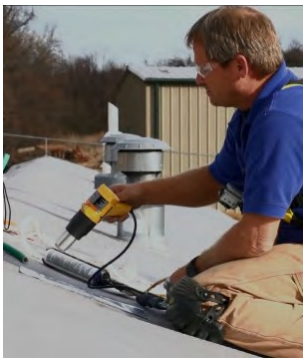
Use a 10"x10" sheet metal patch to mark the center of the hole.

Apply sealant to the underside of the sheet metal patch.

Secure the metal patch to the roof being sure to place mechanical fasteners through the sealant.



Apply a 14"x14" self adhering roof patch on top of the sheet metal patch.



Use a heat gun to make the adhesive pliable to get the best possible seal.

Forcefully roll the patch into place, starting from the center and working toward the edge.

Tools:

1. Roller
2. Self adhering patch
3. sheet metal
4. 6" duct cap(to match 6" hole)
5. heat gun
6. drill

MH Blown Insulation Interior Prep

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space

Specification(s):
Setup a dust control enclosure for all interior access locations that limits insulation and construction dust exposure to the occupant and occupant belongings.

Objective(s):
Protect occupant health and safety

Protect occupant belongings

Bad Practice

Improperly prepared workspace with cellulose all over client belongings and bedroom

Best Practice

Worker has removed or covered occupant belongings. Be sure to ask permission before removing any client belongings

Tools:

1. Utility knife

Materials:

1. Plastic sheeting
2. Removable, low-residue tape

MH FG Blown Insulation Installation from Interior

Desired Outcome:
Consistent, uniform thermal boundary and air barrier between the conditioned space and unconditioned space

Specification Checklist:

- ☐ Insulation will be installed to a density of 1.5 to 1.6 pounds per cubic foot
- ☐ Using fill tube, 100% of each cavity will be filled to a consistent density ak field guide 25.7
- ☐ Fill tube will be inserted within 6" of the end of each attic cavity
- ☐ Insulation will be installed into the void of the attic cavity:
  - . If existing insulation is roof-mounted, insulation will be blown below
  - . If existing insulation is ceiling-mounted, insulation will be blown above
  - • If existing insulation is mounted at both locations, insulation will be blown in between
- ☐ Flame spread and smoke-developed index for insulation will be a flame spread rating of 25 or less and a smoke development rating of 450 or less when tested in accordance with ASTM E84

Objective(s):
Fill entire attic cavity to the prescribed R-value to reduce air infiltration

Avoid clogging of the cavity and the fill tube

Prevent damage to the ceiling

Fire safety will be maintained

Attic insulation should be consistently installed in each cavity to the edge.

Holes should be effectively sealed, as well as aesthetically pleasing.

3.0101.1 Holes, Penetrations, and Marriage Line

MH Marriage Line Air Sealing

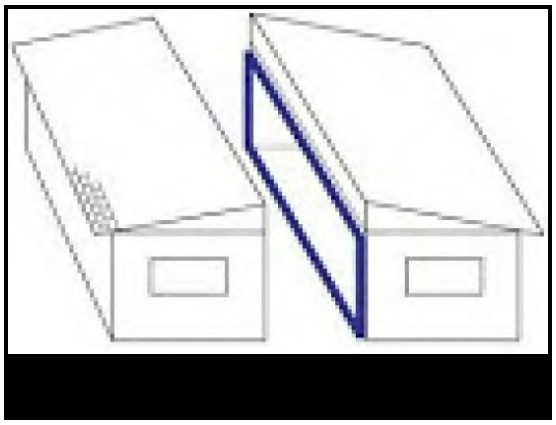
Desired Outcome:
Penetrations sealed to minimize air leakage and moisture movement between unconditioned and conditioned space;

Specification(s):
All accessible holes and penetrations at marriage lines will be sealed continuously at end walls, floors, and ceiling.

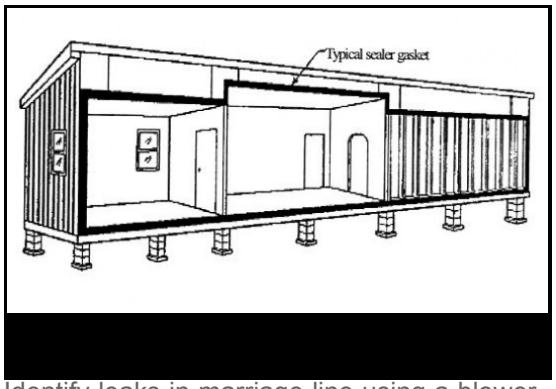
Backing or infill will be provided at the marriage line as needed.

All remaining gaps will be sealed with an approved material.

Objective(s): Minimize air leakage, Maintain durability, Ensure sealant is effective and durable.



The marriage line is a common location of air leakage in a mobile home building shell.



Identify leaks in marriage line using a blower door

Marriage Line Checklist:

- The marriage line is air sealed from inside the home and from underneath.
- Use a blower door and chemical smoke to pinpoint air leakage locations.
- You may need to remove interior trim to determine what type of sealing is needed at the marriage line.
- Some double wide manufactured homes are constructed with a compressed open-cell polyurethane foam sealing strip with excellent air sealing properties and will need little or no additional work.
- Other construction methods may feature fiberglass or other ineffective air sealing measures and require extensive caulking and foaming to reduce air infiltration.

Floor Repair

Desired Outcome:
Penetrations sealed to minimize air leakage and moisture movement between unconditioned and conditioned space; all repairs will maintain structural integrity

Specification Checklist:

- [ ] Floor repair material will meet or exceed strength of surrounding floor material.
- [ ] Repair will span from joist to joist and blocking added as needed to support floor.
- [ ] Patches smaller than 144 square inches will not require repairs from joist to joist.
- [ ] Floor repair material will be glued, mechanically fastened, and air sealed.

Objective(s):
Ensure floor is structurally sound

Minimize air leakage

Remove floor coverings from damaged area

Completed floor repair

MH Repair Duct Trunk Access

Desired Outcome:

Deliver all air from air handler to the trunk duct without leakage or restriction

Specification(s):

Point of access options include:

Option 1: Through the trunk duct

- Repair and seal access hole in the trunk duct
- Install insulation
- Repair belly/bottom liner

Option 2: Remove crossover duct

- Reattach crossover duct
- Seal and insulate crossover duct
- Repair belly/bottom liner

Option 3: Remove air handler

- Install new gasket, if necessary
- Mechanically attach furnace to the structure
- Reconnect utilities
- Replace and seal panels

Option 4: Through the furnace panel

- Replace and seal panels

Best Practice

Various methods can be employed, but the key is to seal the furnace to trunk duct connection

Objective(s):

Repair work access

Prevent condensation

Minimize heat loss and heat gain from plenum

Choose the least invasive and labor-intensive method that will allow full access for sealing.
Patch trunk using sheet metal patch, fastened mechanically and sealed with mastic.
Always wear hand protection when working with sharp objects.

MH Repair Duct Trunk Access (cont)

For electric furnaces, follow lockout/ tag-out procedures to break circuits that supply furnace with electricity.

Cut belly to expose duct trunk. Use a utility knife to cut access under furnace plenum

Create an opening large enough to completely seal the plenum to the trunk line. Patch opening with sheet metal and seal.

Using mastic and mesh tape, fully seal the furnace to the trunk line. Repair and seal the access holes in duct and belly

Removing the crossover duct may provide access to the plenum. Replace and seal the crossover duct after sealing plenum

Remove the furnace panel. If the plenum to trunk connection is accessible here, complete sealing from this point

Plenum to duct trunk connection coated with mastic sealant

As with all duct sealing and repair, confirm success with pressure diagnostics.

MH Crossover Duct Repair

Desired Outcome:
Durable and effective crossover duct installation

- [ ] Flexible crossover duct connections will be added, rebuilt, or repaired using compatible
- [ ] materials Mechanically fastened at both inner and outer liner
- [ ] Sealed using UL -listed sealant that is durable, structurally sound, insulated
- [ ] Equipped with a vapor retarder
- [ ] Whenever possible, rigid elbow or equivalent will be installed in crawl space crossover ducts
- [ ] Floor insulation will be in contact with the outer liner of the crossover duct
- [ ] Crossover duct vapor retarder will be sealed to the bottom liner (e.g., belly fabric)
- [ ] Use only 26-gauge rigid or greater for crossover
- [ ] If a new crossover is required, it must be insulated to at least R-8 and be air sealed.
- [ ] In attics, if sufficient space is not available for rigid duct installation, flexible duct may be used

Before

Poorly performing crossover duct: poor materials, excess length and contacting ground.

Best Practice

Crossover duct of rigid material, sealed, insulated and supported to specification.

Notes: Crossover duct support shall comply with *5.0105.2a - Support*

MH Rigid Crossover Duct Install

Attach elbow duct and orient in correct direction to minimize duct run

Fasten elbow in place with at least three evenly-spaced fasteners

Apply mastic at all metal-to-metal connections

Apply mastic to all elbow joints and flange

Insulate and support crossover duct

When clearance requires crossover to contact ground, crossover shall rest on vapor barrier and closed cell rigid foam.

All duct sealing and repair will be confirmed with pressure diagnostics.

Tools:

1. Drill
2. Metal snips
3. Metal crimper

Materials:

1. Rigid ducting: elbows, straight sections
2. Sheet metal screws
3. Mastic or other appropriate sealant
4. Vinyl-faced fiberglass insulation, R-8 or greater.
5. Nylon twine or wire
6. Rigid foam
7. Duct support materials

MH Preparation for Belly Insulation Blow

Desired Outcome:
Belly floor cavity ready for insulation

Specification(s):
Where bottom board/rodent barrier is missing or damaged and accessible, the following will be ensured:

- Duct sealing completed.
- Water line will be located on the warm side of the insulation; if not, the water lines will be insulated appropriately.
- No water or gas leaks are present.
- Gas, water, and electrical lines secured at least every 4' to a floor joist or framing member.
- Bottom board/rodent barrier is sound/strong enough to support insulation.

When bottom board is intact, the following will be ensured:

- Holes and penetrations in the bottom board and decking sealed
- Duct sealing completed.
- No water or gas leaks present.
- Bottom board is sound/strong enough to support insulation.
- Water lines are secured to the floor joists/warm side of the insulation; if not, the water lines will be insulated appropriately.

Problems will be corrected before floor cavity insulation work begins.

Objective(s):
Ensure problems are corrected before floor cavity insulation work begins

Keep pipes from freezing

Damaged rodent barrier ("belly") must be patched prior to insulating, or to reduce air flow if not insulating.

Belly with patching complete.

MH Preparation for Belly Insulation Blow (cont)

Belly damage: rodent barrier and insulation are damaged, revealing a main supply duct known as a trunk.

ak field guide 25.7

Mobile home duct systems (plenum, trunk terminations) should be sealed from below prior to patching the belly.

Workers install new material where rodent barrier is missing

Maintain all combustion air intake openings when patching belly material.

Pin up sagging belly material to prevent installing excessive amounts of insulation material.

ak field guide 25.7

MH Insulate Belly with Loose Fill

Desired Outcome:
Consistent thermal boundary between conditioned and unconditioned space that reduces heat flow

Specification(s): Each cavity will be insulated to specified R-value and density

The number of bags installed will be confirmed and will match the number required on the coverage chart

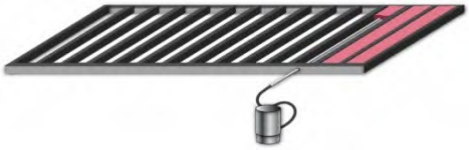
Objective(s): Eliminate voids and settling

Holes are cut through rodent barrier (belly material) to insert insulation blow hose.

Loose fill insulation is blown into mobile home belly cavity.

Blow holes in belly material patched.

Cross section of belly cavity viewed from end of mobile home with lengthwise joists. Note duct location.



Cut away view of belly cavity with joists running crosswise. Insulation blown through rim joist.

Cross section of belly cavity viewed from end of mobile home with crosswise joists. Note duct location.

Cut away of belly cavity with joists running lengthwise. Insulation blown through rim joist.

Belly cavity blown by drilling through rim joists.

MH Access Wall Cavities for Insulating

Desired Outcome:
Consistent thermal boundary and air barrier between the conditioned space and unconditioned space

Specification(s):
If skirting overlaps siding, skirting will be detached to allow access to the wall cavity

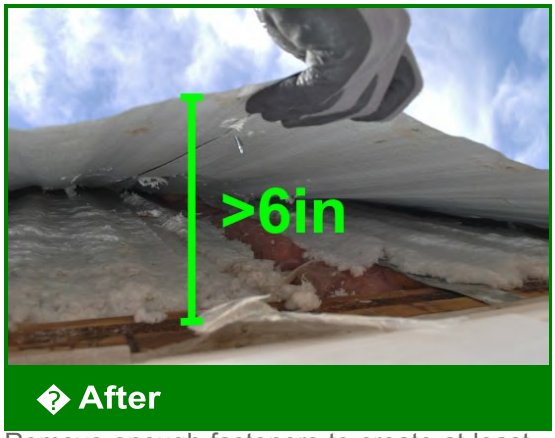
Fasteners will be removed from the bottom of the siding, working upward until the siding can be pulled away from the framing approximately 6" without damaging the siding

Temporary fasteners will be installed near the bottom of the siding panels at the seams to prevent separation

If a subsheathing is present under the siding, access through the subsheathing will be required

Objective(s): Gain access to the wall cavity without damaging or separating the siding

Remove fasteners from along bottom and side seams to access wall cavity



Remove enough fasteners to create at least a 6in gap without damaging siding


If skirting overlaps siding, remove skirting


Temporarily fasten siding panels at joint to hold seam together


Seam should remain together with temporary fastener

MH Exterior Wall Cavity Inspection for Adding Insulation

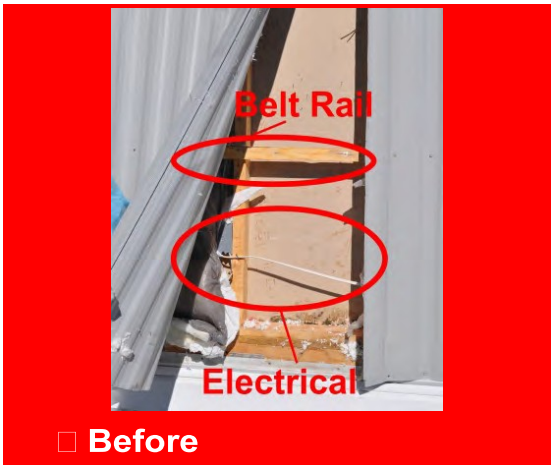
Desired Outcome:
Consistent thermal boundary and air barrier between the conditioned space and unconditioned space

Checklist:

- ☐ Wall cavities will be inspected for moisture damage, pest locations, and integrity of the wiring, and holes to the interior.
- ☐ Siding will be repaired as necessary
- ☐ Location of belt rails, obstructions, and existing insulation will be identified
- ☐ All interior surfaces of exterior walls will be inspected for loose paneling joints, occupant wall hangings, location of switches and outlets, and other wall obstructions
- ☐ Objects will be removed from the interior surfaces of the walls being insulated.
- ☐ Interior paneling will be repaired as necessary

Objective(s):
Prepare wall cavity for insulation

Prevent water leaks from occurring



Take note of obstacles in the wall cavity, such as belt rails and electrical wiring

Assess that holes in both exterior siding and interior walls have been patched before beginning installation

MH Fiberglass Batt Wall Installation

Desired Outcome:
Consistent thermal boundary and air barrier between the conditioned space and unconditioned space

Specification Checklist

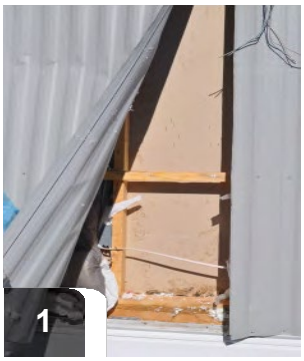
- ☐ Thickness of the batt will fill the void without deforming siding or damaging structure
- ☐ Fiberglass batts will fill the cavity (e.g., batt may be cut approximately 1" longer to ensure proper fill and allow for lap at the top)
- ☐ Flexible membrane will have an appropriate perm rating for the region
- ☐ Flexible membrane will be cut 2" wider than the cavity and approximately 1' longer than the batt
- ☐ Stuffer tool, membrane, and fiberglass batt will be aligned for installation
- ☐ Stuffer tool will be used to install the fiberglass batt and membrane at the same time
- ☐ Excess fiberglass batt and membrane vapor retarder will be trimmed to fit.
- ☐ A poly-encased fiberglass batt may be used in place of the fiberglass batt and membrane assembly
- ☐ The membrane will be installed in contact with the heated side of the wall.

Objective(s):
Maintain integrity of the batt

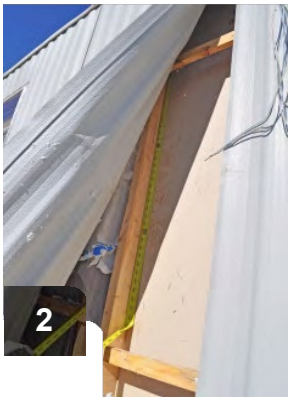
Aid in the installation process

Fiberglass batt should fill entire cavity without creating bulging in exterior paneling

MH Fiberglass Batt Wall Installation (cont)



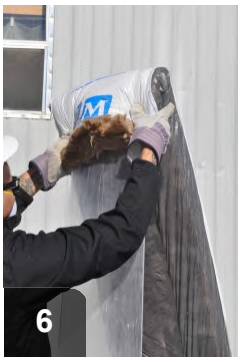
Uninsulated wall cavity can be accessed from exterior of mobile home through paneling



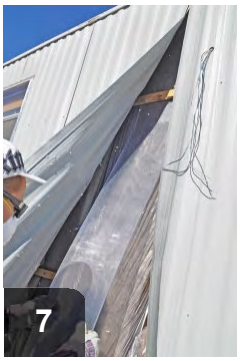
Measure length of cavity

Select appropriate batt thickness and R-value. Wrapped batts provide a built in vapor barrier

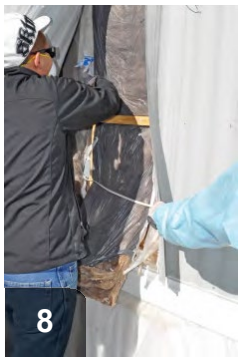
Measure batt to length of cavity with extra for overlap from stuffing tool



Lap cut batt over bent end of stuffing tool



Beginning with lapped end, tuck batt under top belt rail and stuff batt up to top of cavity. Remove stuffing tool



Tuck bottom of batt behind bottom belt rail. If longer than cavity, cut to within 1" longer, roll and tuck into cavity

MH Fiberglass Batt Installation Tool (Stuffer)

Desired Outcome:

Consistent thermal boundary and air barrier between the conditioned space and unconditioned space

Specification(s):

A sheet of polycarbonate, such as Lexan, will be cut to the following specifications to create a stuffer tool:

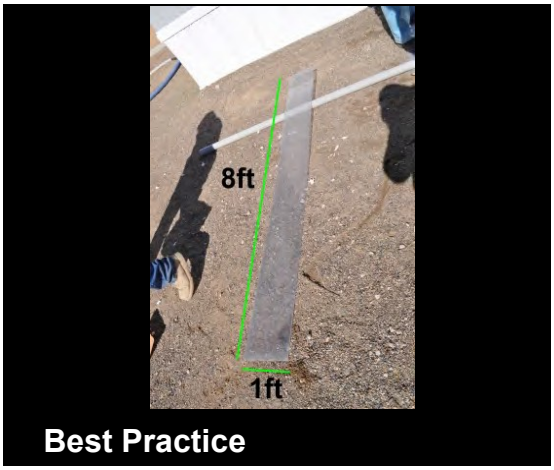
- Approximately 1' x 8' x ¼" with a 5 degree bend 7' ½" from the bottom
- All corners of the Lexan (polycarbonate) will be rounded and all edges will be sanded

Other clear sheet plastics will not be used due to a tendency to shatter under stress

Objective(s):

Create a tool to install a fiberglass batt into the cavity

Ensure worker safety



Insulation stuffing tool should be made of 1/4" polycarbonate, cut to 1' wide and 8' long

At one end, a bend of 5 degrees (175 degree supplement) should be made 7 1/2" from narrow edge

Tools:

1. Heat-resistant gloves
2. Table saw with fine-toothed blade
3. Sander
4. Heat gun
5. Clamp
6. Protractor
7. Tape measure

Materials:

1. Polycarbonate, like Lexan
2. Sandpaper

Most crews should have this tool in their supply. If one needs to be fabricated, find someone who has worked with polycarbonate before and ensure correct tool usage as well as proper PPE during fabrication.

MH Reattachment of Siding

Desired Outcome:
Consistent thermal boundary and air barrier between the conditioned space and unconditioned space

Specification(s):
If skirting was removed, skirting will be reinstalled to shed water to the outside of the skirting

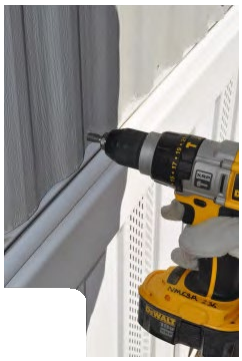
Siding will be reattached with new fasteners

Siding will be reattached without bulges or wrinkles

Objective(s):
Ensure the integrity of the drainage plane

Return siding to existing conditions without damage

After wall cavities have been stuffed, paneling needs to be put back into place and refastened



Using new fasteners, reattach paneling

Verify that siding and skirting have not been damaged and show no signs of bulging

GLOSSARY

A

AAMA
American Architectural Manufacturers Association, www.aamanet.org
AARST
American Association of Radon Scientists and Technologists, www.aarst.org
AB
Air barrier
ACCA
Air Conditioning Contractors of America, www.acca.org
ACM
Asbestos-containing material
ADA
Americans with Disabilities Act
ADC
Air Diffusion Council, www.flexibleduct.org
AFUE
Annual fuel utilization efficiency
AGA
American Gas Association, www.aga.org
AHJ
Authority having jurisdiction
AHRI
Air Conditioning, Heating, and Refrigeration Institute, www.ahrinet.org
Air barrier
The separation between the interior and exterior environments of a building that slows air flow to the point that no smoke movement is visible at 50 pascals of pressure difference across the boundary
AL
Action level
ANSI
American National Standards Institute, www.ansi.org
ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers, www.ashrae.org
ASTM
American Society for Testing and Materials, www.astm.org

B

Backdraft damper
A damper that allows air to flow in only one direction
Beaded collar
A round fitting with a ridge or lip part way down its length that prevents a flexible duct mechanically attached with a tie band from sliding off
Bonus room
A livable room that is often over a garage or in an attic area; the room commonly contains slanted ceilings and knee walls
BPI
Building Performance Institute, www.bpi.org
BTU
British thermal unit

C

Can light
A light fixture (or can) that is recessed into the ceiling

Cathedral ceiling
A condition in which the ceiling slopes and normally has the same slope as the roof.

Cathedralized attic
An attic that contains insulation located at the roof deck rather than the attic floor, bringing the attic space into the thermal boundary of the house.

CAZ
Combustion appliance zone

CFL
Compact fluorescent lamp

CFM
Cubic feet per minute

CGSB
Canadian General Standard Board

Closed crawl space
A foundation without wall vents that uses air-sealed walls, ground and foundation moisture control, and mechanical drying methods to control crawl space moisture.

CO
Carbon monoxide

Conditioned basement
A below- or partially below-grade livable space with concrete or finished floor that is intentionally heated or cooled.

Conditioned crawl space
A foundation without wall vents that encloses an intentionally heated and/or cooled space

CPSC
Consumer Product Safety Commission

CSA
Canadian Standards Association

D

DACUM
Developing a curriculum

Dense pack
The process of installing loose-fill insulation to a density that stops airflow @ 50 pascals of air pressure.

DHW
Domestic hot water

Dielectric union
A plumbing connection that separates two different materials and prevents them from chemically reacting .

Draft regulator
A device that functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value. Source: National Fire Protection Association 54, 2012 .

Dual-Cooling Up-Duct
Piece of duct located between the living space and attic to allow air flow in pressurized homes having evaporative coolers.

dBA
A-weighted decibels

E

Efflorescence
Deposits of mineral salts, that may appear crystaline, left attached to masonry materials after moisture has evaporated off of the surface

Egress window
A window that meets building code requirements for size, location, and opperabiltiy which can be used to bodily escape through in an emergency

EIFS
Exterior insulation and finish systems

EIMA
EIFS Industry Members Association

Energy factor
Measure of overall efficiency for a variety of appliances. For water heaters, the energy factor is based on three factors: 1) the recovery efficiency, or how efficiently the heat from the energy source is transferred to the water; 2) stand-by losses, or the percentage of heat lost per hour from the stored water compared to the content of the water: and 3) cycling losses. For dishwashers, the energy factor is defined as the number of cycles per kWh of input power. For clothes washers, the energy factor is defined as the cubic foot capacity per kWh of input power per cycle. For clothes dryers, the energy factor is defined as the number of pounds of clothes dried per kWh of power consumed.

Envelope
The separation between the interior and exterior environments of a building that includes a combination of air and thermal barrier

EPA
U.S. Environmental Protection Agency, www.epa.gov

ERV
Energy recovery ventilator

ESP
External static pressure

Exfiltration
The uncontrolled passage of inside air out of a building through unintended leaks in the building envelope

Exterior storm window
An additional window assembly installed on the exterior of the main window

F

Finished attic
An attic space that has been converted into an additional living space of the house

G

GFCI
Ground-fault circuit interrupter

GPM
Gallons per minute

H

Hi-limit switch
A protective electronic switch which turns off an appliance if the operating temperature reaches the setpoint to prevent damage or fire

HRV
Heat recovery ventilator

HVAC
Heating, ventilation, and air conditioning

HVI
Home Ventilation Institute

Hydrophobic
Lacking affinity for water; tending to repel and not absorb water; tending not to dissolve in, mix with, or be wetted by water

I

I-P
Inch-pound

IAQ
Indoor air quality

IBC
International Building Code

IBR
Institute of Boiler and Radiator Manufacturers

IC
Insulation contact

ICC
International Code Council

IECC
International Energy Conservation Code

IFGC
International Fuel Gas Code

Ignition barrier
Any layer of material that protects another from catching fire due to heat or spark

IMC
International Mechanical Code

Infiltration
The uncontrolled passage of outside air into a building through unintended leaks in the building envelope

Interior storm window
An additional window assembly installed on the interior of the main window

IPM
Integrated Pest Management

IRC
International Residential Code

IWC
Inches of water column

J

JTA
Job task analysis

K

Knee wall
Any wall between the conditioned space and the attic

KSA
Knowledge, skills, and abilities

L

LED
Light-emitting diode

M

MERV

Minimum efficiency reporting value

Modulating systems

Heating systems with the ability to adjust the heating capacity and output based on the heating demand

N

NAHB

National Association of Home Builders, www.nahb.com

NAIMA

North American Insulation Manufacturers Association, www.naima.org

NATE

North American Technician Excellence, www.natex.org

NEBB

National Environmental Balancing Bureau, www.nebb.org

NEC

National Electrical Code

NFPA

National Fire Protection Association, www.nfpa.org

NIOSH

National Institute for Occupational Safety and Health, www.cdc.gov/niosh

O

Orphaned equipment

Condition that exists when only one combustion appliance is left vented into a common chimney when the other appliance(s) are removed from the vent system. What remains is a larger exhaust flue or chimney than is necessary for the remaining smaller appliance which may lead to venting problems for the single appliance

Orphaned water heater

Condition that exists when only a water heaters is left vented into a common chimney when the other appliance(s) are removed from the vent system. What remains is a larger exhaust flue or chimney than is necessary for the remaining smaller appliance which may lead to venting problems for the single appliance

OSHA

U.S. Occupational Safety and Health Administration, www.osha.gov

P

PEL

Permissable Exposure Limit

Perm rating

The measurement of a material's ability to allow the transfer of water vapor through the material

PPE

Personal Protective Equipment

Programmable thermostat

A thermostat designed to adjust the temperature according to a series of programmed settings that take effect at different times of the day

Psi

Pounds per square inch

Psig

Pound per square inch gauge

R

Reverse or upslope lapping technique
Upper course laps under a lower course to keep the moisture under the barrier

Rigid material
Drywall, oriented strand board, duct board, cardboard, or any other stiff product that may support the applied load while serving as a durable air barrier

RPA
Radiant Professional Alliance

RRP
Renovation, repair, and painting

S

SDS
Safety Data Sheet

Sealant foam
One- or two-component polyurethane foam typically applied as a bead and used to control air leakage as part of an air barrier system within the building envelope

Service switch
An electrical switch that controls the complete flow of electricity to a mechanical device

SHGC
Solar heat gain coefficient

SI
Systeme International

SMACNA
Sheet Metal and Air Conditioning Contractors' National Association, www.smacna.org

SPF
Spray polyurethane foam

SPFA
Spray Polyurethane Foam Alliance

SSE
Steady state efficiency

Standby loss
1) Heat loss through the outer shell of a water heater. 2) Energy that is used even when a device is turned off.

Storm door
An additional door assembly that is installed on the exterior of the main door

Strip heat
A function of a heat pump that uses energy-intensive resistance heat strips to warm conditioned space when the heat pump is unable to satisfy the heating demand; also provides emergency heat backup for heat pumps.

Support material
Typically, wooden strips or boards that provide support over large holes for less rigid air barrier materials.

T

T&TA
Training and Technical Assistance

TABB
Testing and Balancing Bureau, www.tabbcertified.org

TDC
Transverse duct connector

TDF

Thermal boundary
The separation between the interior and exterior environments of a building that slows heat flow
Thermal resistance
The measurement of how effectively an object or material resists heat flow. R-value is a measurement of thermal resistance
Tie band
A strap, often made of nylon, that mechanically squeezes a flexible duct to a fitting. Must have a minimum performance temperature rating of 165 degrees F (per UL 181A-type test) and a minimum tensile strength rating of 50 pounds

U

UL
Underwriters Laboratories
Unconditioned basement
A below- or partially below-grade livable space with concrete or finished floor without intentional heating or cooling
UV
Ultraviolet

V

Vapor retarder
A material that slows the passage of water vapor
Vapor retarder - Class I
A material that retards the passage of water vapor with a perm rating of less than 0.1
Vapor retarder - Class II
A material that retards the passage of water vapor with a perm rating of greater than 0.1 but less than 1.0
Vapor retarder - Class III
A material that retards the passage of water vapor with a perm rating of greater than 1 but less than 10
Vaulted ceiling
A condition where a non-horizontal ceiling has a different slope than the roof
Vented crawl space
A foundation that uses wall vents as a primary means to control moisture
VOC
Volatile organic compound

W

WAP
DOE Weatherization Assistance Program
WDMA
Window and Door Manufacturers Association, www.wdma.com
Wg
Water gauge
Wind intrusion
A condition where air from outside of a structure can pass through insulation and reduce its performance
Wood/materials shrinkage
A loss of dimension and weight as a result of drying the structure and operating the building at lower relative humidity