

Home Energy Savings Program

California

Weatherization Trade Ally Manual

Version 1.2

Release Date – June 18, 2014

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Glossary

ACCA	Air Conditioning Contractors of America
AFUE	Annual Fuel Utilization Efficiency
AHRI	Air Conditioning, Heating and Refrigeration Institute
CAC	Central Air Conditioner
CAZ	Combustion Appliance Zone
CFM	Cubic Feet per Minute
ECM	Electronically Commutated Motor
EER	Energy Efficiency Ratio
HES	Home Energy Savings
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilation, and Air Conditioning
PP	Pacific Power
SEER	Seasonal Energy Efficiency Ratio
TXV	Thermal Expansion Valve
QPL	Qualified Products List
Electric Heat	Permanently installed, ducted system consisting of an electric furnace, heat pump or electric zonal heating system (baseboard or ceiling/wall heaters) serving as the home's current primary heat source (space heaters do not qualify)
Electric Cooling	Permanently installed, electric heat pump or ducted electric central air conditioner serving as the home's current primary cooling source. Room air conditioners and evaporative cooler do not qualify
Non-Electric Heat	Heating system with gas, oil, or propane serving as the home's current primary heat source

Version History

Version #	Section	Release Date	Revision
1.2	All	June 18, 2014	Added attic insulation information.

Pacific Power's HES program will update this trade ally manual periodically.

Purpose of This Manual

This manual is meant to provide trade allies with a comprehensive overview of Pacific Power's Home Energy Savings weatherization program. It has been developed with a companion set of reference materials and applicable worksheets to assist trade allies with the installation of program-approved weatherization services.

Home Energy Savings Overview

The PP HES program offers cash incentives on a variety of HVAC, plumbing, and weatherization equipment and services. The program promotes installation practices that are designed to maximize system performance and efficiency. By helping customers minimize their energy use, the HES program saves customers money on their energy bill and also reduces the growing demand for power in the region.

The program was originally designed for single family installation. However, due to increased interest in multifamily¹ and manufactured home installations, the program has extended incentives for each category in select states, each involving its own unique application process. For multifamily projects, please refer to the Pacific Power Trade Ally Manual and contact the program via the website at homeenergysavings.net, by phone 1-800-942-0281, or HesTradeAllyPP@pacificpower.net for additional requirements or to make an appointment for a pre-qualification inspection. Please refer to the HES website at homeenergysavings.net for additional requirements regarding new or manufactured homes incentives.

Trade Ally Overview

A trade ally is a contractor (general, HVAC, weatherization, or plumber) or retailer who sells or installs qualifying equipment or performs services for home energy efficiency upgrades. There are two types of program trade allies: participating or qualifying.

Participating trade allies:

Participating applies to a trade ally that has met the basic requirements (outlined on the next pages) to perform work for the HES program.

Qualified trade allies:

Qualified applies to a trade ally that has met the basic requirements (outlined in the next pages) and that has also successfully completed additional relevant industry training(s) required for specific services (e.g. PTCS, BPI, NATE, etc.). Documentation of the completed training must be submitted with the participation agreement and must include the name of the individual trained, certification number, certification type, date trained, and expiration date (if applicable). If you or your technicians require additional training in order to meet program requirements, please let us know and we will work with you to identify appropriate local resources or provide on-site technical coaching.

¹ 5 or more attached units with shared floors and/or walls

Program-Eligible trade allies:

The term “program-eligible trade ally” is used when an installation can be completed by either a participating or qualified trade allies. This term is used on HES marketing materials and the website to explain to customers what type of trade ally they need to hire in order to receive an incentive.

California Weatherization Trade Ally Requirements		
Equipment or Service	Trade Ally Type	Additional Qualifications
Air Sealing	Qualified Trade Ally	BPI
Attic Insulation	Program-Eligible Trade Ally	None
Wall Insulation	Program-Eligible Trade Ally	None

Existing Single Family Homes Incentives

Air Sealing

15%-29.9% Reduction Customer Incentive: \$200

30% Reduction or Greater Customer Incentive: \$200

15%-29.9% Reduction Trade Ally Incentive: N/A

30% Reduction or Greater Trade Ally Incentive: \$200

Qualifications:

- Work must be completed by a Program-Qualified Trade Ally
- Air Sealing must be performed following the Checklist outlined on pg. 9
- CAZ Testing must be performed per program requirements outlined on pg. 12

Ensure the home qualifies:

- Must be an existing home, not new construction
- An electric heating system must serve at least 80% of the home's conditioned living space

Application:

- **Insulation Application**- completed and signed

Itemized receipt or invoice:

- Date of purchase
- Date work initiated
- Date work completed
- Product and/or service description and costs

Additional Documents:

- W-9 for businesses receiving an incentive
 - Third party addendum for landlords property owners who are not listed on the utility account and who are applying for incentives
-

Existing Single Family Homes Incentives Continued

Attic Insulation

Electrically Heated Home Customer Incentive: \$0.20/sq. ft.

Qualifications:

- Existing insulation: R-19 or less
- Final insulation: R-38 or greater

Wall Insulation

Electrically Heated Home Customer Incentive: \$0.75/sq. ft.

Qualifications:

- Existing insulation: No existing wall insulation
- Final insulation: R-13 or greater or fill wall cavity
- Basements do not qualify
- Interior walls, such as walls between rooms, do not qualify
- Insulation along rim joists does not qualify

Ensure the home qualifies:

- Work must be completed by a Program-Eligible Trade Ally or self-installed by the homeowner
- Must be an existing home, not new construction
- Electric heating system must serve at least 80% of the home's conditioned living space
- Work must be completed per program specifications found on pg. 24
- Electrically cooled homes do not qualify for insulation incentives
- For each area of the home, limit one incentive per insulation type, for the lifetime of the home
- Insulation must be installed between unconditioned and conditioned living spaces

Application:

- **Insulation Application**- completed and signed

Itemized receipt or invoice:

- Date of purchase
- Date work initiated
- Date work completed
- Square footage of area(s) insulated
- Pre-existing R-value
- Added R-value

Additional Documents:

- W-9 for businesses receiving an incentive
 - Third party addendum for landlords property owners who are not listed on the utility account and who are applying for incentives
-

Existing Single Family Homes Incentives Continued

Whole Home Upgrade Package

Customer Incentive: \$1,000 bonus per home

Qualifications:

- Must be an existing home, not new construction
- Work must be completed by a Program-Eligible Trade Ally as outlined in each measures qualifications/requirements
- Work must be completed within a 6 month time frame
- Package Options:
 1. Ductless heat pump, whole home attic insulation, whole home wall insulation, and air sealing
 2. Heat pump conversion, whole home attic insulation, whole home wall insulation, and air sealing
 3. Heat pump upgrade, whole home attic insulation, whole home wall insulation, and air sealing

Application:

The following applications must be completed and signed:

- **Insulation Application**
 - **Heat Pump Application**
-

Multi-family Incentives

Attic Insulation

Electrically Heated Home Customer Incentive: \$0.35/sq. ft.

Qualifications:

- Existing insulation: R-19 or less
- Final insulation: R-38 or greater

Wall Insulation

Electrically Heated Home Customer Incentive: \$0.75/sq. ft.

Qualifications:

- Existing insulation: No existing wall insulation
- Final insulation: R-13 or greater or fill wall cavity
- Basements do not qualify
- Interior walls, such as walls between rooms, do not qualify
- Insulation along rim joists does not qualify

Ensure the home qualifies:

- Work must be completed by a Program-Eligible Trade Ally or self-installed by the property owner or landlord
- Must be a multifamily structure
- Electric heating system must serve at least 80% of the home's conditioned living space
- Work must be completed per program specifications found on pg. 24
- Electrically cooled homes do not qualify for insulation incentives
- For each area of the home, limit one incentive per insulation type, for the lifetime of the home
- Insulation must be installed between unconditioned and conditioned living spaces

Application:

- **Multifamily One Pager-** completed and signed
- **Multifamily Spreadsheet**

Itemized receipt or invoice:

- Date of purchase
- Date work initiated
- Date work completed
- Square footage of area(s) insulated
- Pre-existing R-value
- Added R-value

Additional Documents:

- W-9 for businesses receiving an incentive
 - Third party addendum for landlords property owners who are not listed on the utility account and who are applying for incentives
-

Air Sealing

Air Sealing Requirements

- All accessible and applicable items in the air sealing checklist shall be sealed. All locations are conserved accessible except for the following:
 - Locations not physically accessible due to building structure or mechanically fastened materials
 - Top plates located adjacent to eave line
 - Top plates covered by more than five inches of loose-fill insulation or a combination of loose-fill and batt/blanket insulation.
- Provide homeowner [Care for Your Air: A Guide to your Indoor Air Quality \(EPA\)](http://www.epa.gov/iaq/pubs/careforyourair.html)¹ and recommended [RTF Form](#)². All local codes and regulations will be followed.
- If mechanical ventilation is required or installed compliance with the Mechanical Ventilation guidelines below is required.
- If a CAZ is present and will be impacted by air sealing, testing and compliance will be required to ensure owner / occupant safety.
- Testing will be done by PTCS, BPI or PATS certified program trade ally.
- Combustion Appliance Zone testing shall be performed in accordance with the Combustion Appliance Zone Testing Section.
- Air sealing shall not prohibit drainage or maintenance of plumbing system.

¹ <http://www.epa.gov/iaq/pubs/careforyourair.html>

² <http://rtf.nwcouncil.org/subcommittees/res/IAQDisclosureFinal.pdf>

Air Sealing Continued

AIR SEALING CHECKLIST

Attic	
Attic hatch/door	Weather-stripping permanently attached to create an effective air seal between the attic access frame and hatch/door
Pull down stair cover	Gasket or weather-stripping permanently attached between frame and door or air-tight cover installed between stairs and attic
Duct penetrations	Foam/caulk or other air-tight seal around perimeter of duct boots between the boot and the subfloor
Chases	Foam/caulk/rigid material sealed to attic floor/wall; use fire rated materials at chimneys and flues
Recessed cans	Foam/caulk or other air-tight seal between fixture and ceiling or install air-tight drywall, sheet metal, or other non-combustible assembly; maintain 3" space between non-IC rated fixtures and insulation ; Do not insulate above non-IC rated fixtures (see notes in Section AR.1.7) above
Bath fans	Foam/caulk or other air-tight seal around fixture perimeter
Bath fans with heat source	Fire rated materials shall be used Foam /caulk/ rigid sheet if opening larger than 1 inch
Electrical penetrations	Foam/caulk or other air-tight seal around perimeter of electrical junction box
Plumbing penetrations	Penetrations sealed
Top plates	Accessible drywall to top plate connections, wood to wood seams, other wall penetrations sealed with foam/caulk
Drop soffits	Rigid material covering attic floor opening and sealed with foam/caulk
Kneewall doors	Weather-stripping permanently attached to create an effective air seal between the attic access frame and hatch/door. Install latch or handle if necessary
Kneewall transition (under floor paths)	Rigid material between joists; Foam/caulk perimeter of each rim joist
Kneewall bottom plates	Floor/floor plate connection sealed with foam/caulk
Open wall cavities	Rigid material sealed to attic floor/wall
Crawl Space	
Crawlspace hatch/door	Weather-stripping permanently attached to create an effective air seal between the attic access frame and hatch/door
Chases	Foam/caulk/rigid moisture resistant material sealed to ceiling/wall; use fire rated materials at chimneys and flues
Duct penetrations	Foam/caulk or other air-tight seal around perimeter of duct boots between the boot and the subfloor
Plumbing penetration	Penetrations sealed; Rigid moisture resistant material sealed to crawl space/basement ceiling if opening larger than 1 inch
Electrical penetrations	Foam, caulking; Rigid material sealed to crawl space/basement ceiling if opening larger than 1 inch
Other open cavities	Rigid material sealed to ceiling
Conditioned Basement	
Sill plate/stem wall	Sill plate to stem wall connection sealed with foam/caulk

Air Sealing Continued

Walls separating conditioned and exterior/unconditioned space	
Plumbing penetrations	Foam /caulk/rigid moisture resistant material if opening larger than 1 inch
Doors	Weather-stripping and door sweep/air-tight threshold permanently attached to create an effective air seal between interior and exterior/unconditioned space
Other unintentional opening	Sealed with appropriate material if accessible
Electrical boxes (optional)	Seal box to drywall
Baseboards (optional)	
Door & window trim (optional)	
Window weather-stripping (optional)	
Garage Separation Walls	Foam / Caulk Wall penetrations

Air Sealing Continued

Combustion Appliance Zone Testing

- In homes with one or more combustion appliances for the purpose of space heating or water heating, a "worst case depressurization test" shall be performed after air sealing, for all Combustion Appliance Zones (CAZ).
- A CAZ is a conditioned space or enclosed area that contains a combustion appliance for the purpose of space heating or water heating.
- A combustion appliance is any appliance that burns fuel, such as natural gas, propane, oil, or wood. This includes furnaces, boilers, water heaters, wood stoves, and fireplaces.

CAZ Test Procedure

All kitchen, bathroom, and clothes dryer exhaust fans shall be turned on. If the house has a forced air heating system, its air handler fan shall be turned on its highest setting. All interior doors shall be closed if doing so makes the combustion appliance zone more negative.

CAZ Standard

Worst case depressurization with all exhaust fans running shall not de-pressurize a combustion appliance zone by more than the allocated max depressurization levels in the CAZ Depressurization Limits Chart with reference to outside.

CAZ Failure

If a Combustion Appliance Zone fails the worst case depressurization test by being depressurized by more than the allocated max depressurization levels in the chart below, the homeowner must be informed in writing of any potentially hazardous condition or situation, with recommendations to remedy or mitigate the condition or situation.

CAZ Depressurization Limits Chart

Venting Condition	Limit (Pascals)
Orphan natural draft water heater (including outside chimneys)	-2
Natural draft boiler or furnace commonly vented with water heater	-3
Natural draft boiler or furnace with vent damper commonly vented with water heater	-5
Individual natural draft boiler or furnace	-5
Mechanically assisted draft boiler or furnace commonly vented with water heater	-5
Mechanically assisted draft boiler or furnace alone, or fan assisted DHW alone	-15
Exhaust to chimney-top draft inducer (fan at chimney top); High static pressure flame retention head oil burner; Sealed combustion appliances;	-50

Air Sealing Continued

Mechanical Ventilation

General Mechanical Ventilation Requirements

Mechanical Ventilation Compliance is required for homes where Air Sealing is performed. Compliance is defined as providing the required ventilation as per ASHRAE 62.2 2013 or informing the home owners of the additional mechanical ventilation required to meet ASHRAE 62.2 2013 standards.

Mechanical ventilation can be provided in both continuous and intermittent forms conforming to ASHRAE 62.2 2013 Sections 4.1 through 4.5 and 4.6. No infiltration credits will be used to adjust the ventilation requirements due to the lack of blower door test requirement.

Total Ventilation Required

The total ventilation rate can be determined using Table 4.1a from ASHRAE 62.2 2013 or using the equation for (Q_{tot}) which is:

$$Q_{tot} = 0.03A_{floor} + 7.5(N_{br} + 1)$$

Where:

Q_{tot} = total required ventilation rate, CFM

A_{floor} = floor area of residence, ft²

N_{br} = number of bedrooms (not less than 1)

Table 4.1a Ventilation Air Requirements, CFM

Floor Area	# Bedrooms				
(ft ²)	1	2	3	4	5
<500	30	38	45	53	60
501-1000	45	53	60	68	75
1001-1500	60	68	75	83	90
1501-2000	75	83	90	98	105
2001-2500	90	98	105	113	120
2501-3000	105	113	120	128	135
3001-3500	120	128	135	143	150
3501-4000	135	143	150	158	165
4001-4500	150	158	165	173	180
4501-5000	165	173	180	188	195

Bath & Kitchen Fans

- All exhaust fans shall be vented to the exterior of the structure, with ducts mechanically fastened and air-sealed to the termination or the vent.
- Any newly installed exhaust fan ducts must be sized according to Exhaust Fan Prescriptive Duct Sizing requirements.
- Exhaust ducts in unconditioned space shall be insulated to a minimum of R-4.
- Exhaust fan ducts shall not sag, and shall be as straight as possible to maximize effective air flow, and have no more than two 90-degree turns, or equivalent.

Air Sealing Continued

- e) Vent ducts shall be securely attached at each joint and to the fan housing using mechanical fasteners, such as sheet metal screws or a securely tightened metal clamp. Fasteners shall not interfere with damper operation.
- f) Vent duct shall be sheet metal or HVAC flex-duct and insulated to a minimum of R-4. Vinyl coil duct is not allowed.
- g) Existing vent ducts may remain if they are free of holes and kinks and are in otherwise good condition, provided they are vented to the exterior, free of gaps, and sealed to prevent exhaust air from entering back into the attic.

Kitchen Fans

- a) Non-recirculation kitchen range exhaust fans ducts shall be vented to the exterior of the structure, with ducts mechanically fastened and air-sealed to approved metal termination.
- a) Venting kitchen fans to existing plastic ducts and plastic roof vents is not allowed
- b) Any newly installed kitchen exhaust fan ducts must be sized according to Exhaust Fan Prescriptive Duct Sizing requirements.
- c) Kitchen range exhaust fans vented through the ceiling shall be connected to a duct made of 28- gauge galvanized steel, stainless steel, aluminum, or copper (IMC 505.1) which is substantially airtight throughout and which terminates directly to the outside through an approved metal termination. Backdraft dampers are recommended. Existing installations that substantially meet these requirements are acceptable.

Downdraft Exhaust Fans

Downdraft exhaust ducts may have one 90-degree turn, shall exit through the foundation or exterior wall, be sealed (with no visible gaps) to a vent cap designed for kitchen exhaust. Unless otherwise allowed by local code, downdraft exhaust ducts shall comply with material requirements for Kitchen Fans.

Dryer Exhaust

Dryer exhaust ducts shall be vented to the exterior of the structure, sealed to prevent exhaust air from entering the building, shall have a back-draft damper, and shall terminate in a code-approved vent cap.

New dryer ducts shall be rigid metal and shall be securely connected with mechanical fasteners and permanently supported. Exhaust systems shall comply with local code and manufacturer specifications, be as straight as practical, sloped downward to allow condensate drain, and shall not exceed 25 feet. To prevent blockage with lint, new dryer vent ducts shall not be connected with screws. A metal clamp or UL-rated foil tape may be used to secure dryer duct connections.

Exhaust System Makeup Air

Exhaust systems capable of exhausting in excess of 400 CFM shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system.

Air Sealing Continued

Exhaust Fan Prescriptive Duct Sizing

Use table below to size new exhaust fan ducts correctly.

Duct Type	HVAC Flex Duct								Smooth Hard Duct							
Fan Rating in CFM	50	80	100	125	150	200	250	300	50	80	100	125	150	200	250	300
Duct Diameter	Maximum Duct Length in Feet															
3"	X	X	X	X	X	X	X	X	5	X	X	X	X	X	X	X
4"	56	4	X	X	X	X	X	X	114	31	10	X	X	X	X	X
5"	NL	81	42	16	2	X	X	X	NL	152	91	51	28	4	X	X
6"	NL	NL	158	91	55	18	1	X	NL	NL	NL	168	112	53	25	9
7"	NL	NL	NL	NL	161	78	40	19	NL	NL	NL	NL	NL	148	88	54
8"	NL	NL	NL	NL	NL	189	111	69	NL	NL	NL	NL	NL	NL	198	133
Table assumes no elbows. Deduct 15 ft of allowable duct length for each elbow.																

Table from ASHRAE Standard 62.2 (2013), page 8, Table 5.3.

Exhaust Fans

Exhaust fans installed for whole house mechanical ventilation purposes shall be ENERGY STAR compliant, have a sone level of 1 or less, and be rated for continuous operation.

Heat Recovery Ventilation

Energy or Heat Recovery Ventilators installed for whole-house mechanical ventilation purposes shall be certified and listed in the Home Ventilating Institute directory, shall be ENERGY STAR compliant and rated for continuous operation. Any ducts installed as part of a Heat Recovery Ventilation system shall comply with Section D.1. – HVAC Duct Insulation & Sealing.

Air Sealing Continued

Bathroom Fans as Whole-House Fans

Bathroom exhaust fans may be used to provide whole house ventilation as well as bathroom spot ventilation provided all of the following conditions are met:

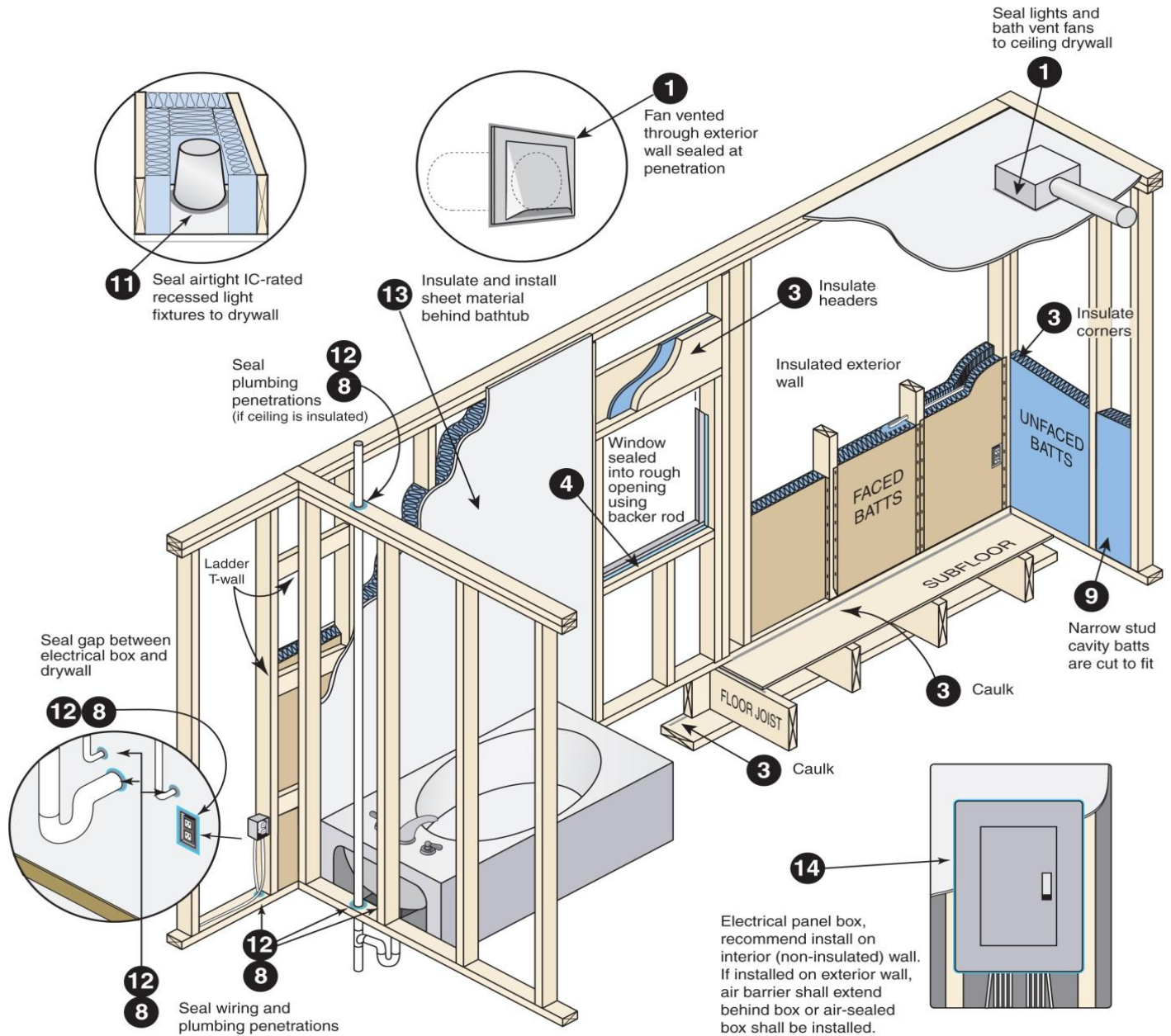
- a) A minimum 1" clearance under the bathroom door to provide for a clear air pathway to the rest of the house when the bathroom door is closed. Or an alternative equivalent means of providing a clear air pathway is installed.
- b) The fan shall have both automatic and manual controls.
- c) The fan is set to run automatically either continuously or intermittently on a timer.
- d) There is a manual control switch for spot-ventilation purposes.
- e) All conditions of Spot Ventilation requirements must be met.

Fresh Air Inlets

Air inlets that are part of the ventilation system shall be located a minimum of 10 feet from known sources of contamination such as stack, vent, exhaust hood, or vehicle exhaust. The intake shall be placed so that entering air is not obstructed by snow, plantings, or other material. Inlets shall have rodent/insect screens with mesh not larger than ½ inch.

Appendix
2009 IECC

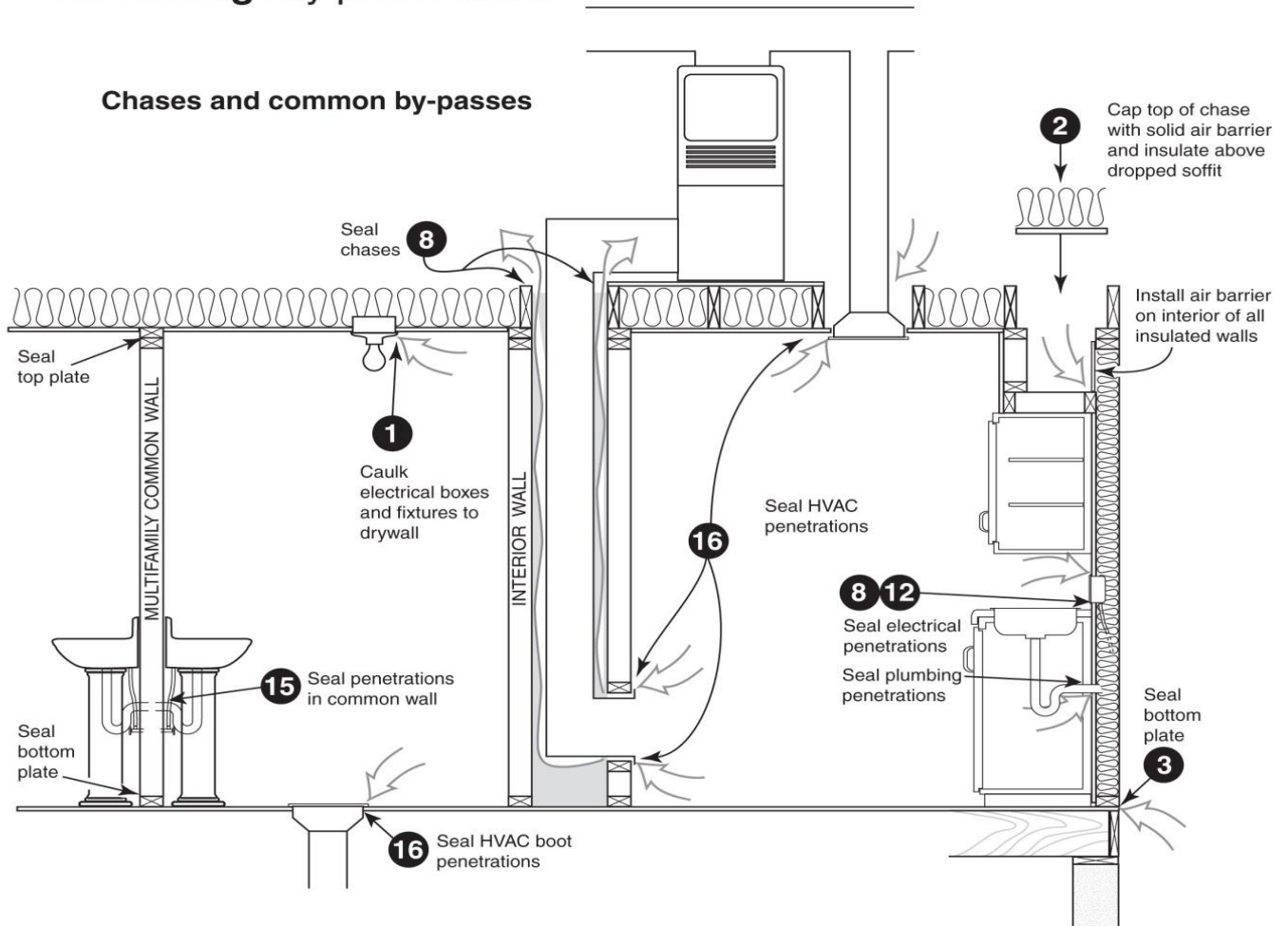
Air sealing key points



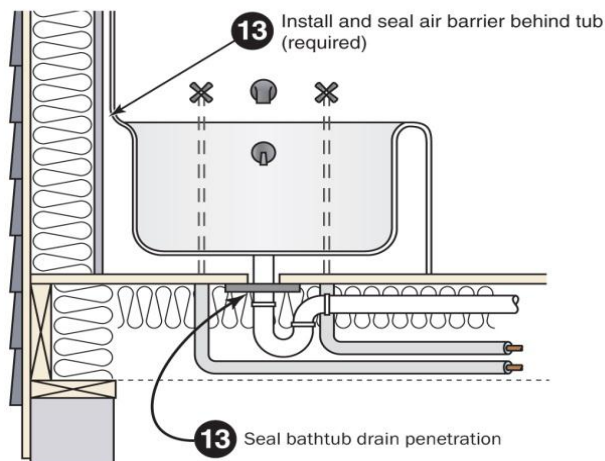
Disclaimer:
This document is intended solely to help graphically demonstrate the air leakage provisions of section 402.4 of the 2009 IECC. It does not cover all airsealing locations or techniques. Other code provisions may be applicable as well.

Air sealing key points *continued*

Chases and common by-passes



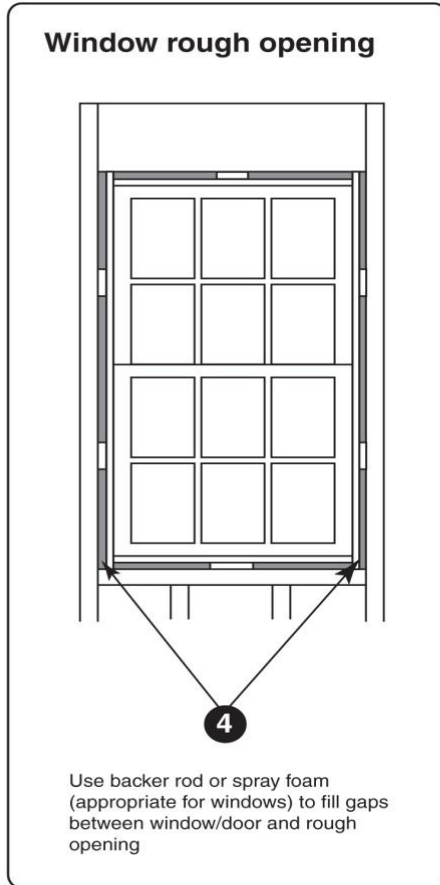
Shower/tub drain rough opening



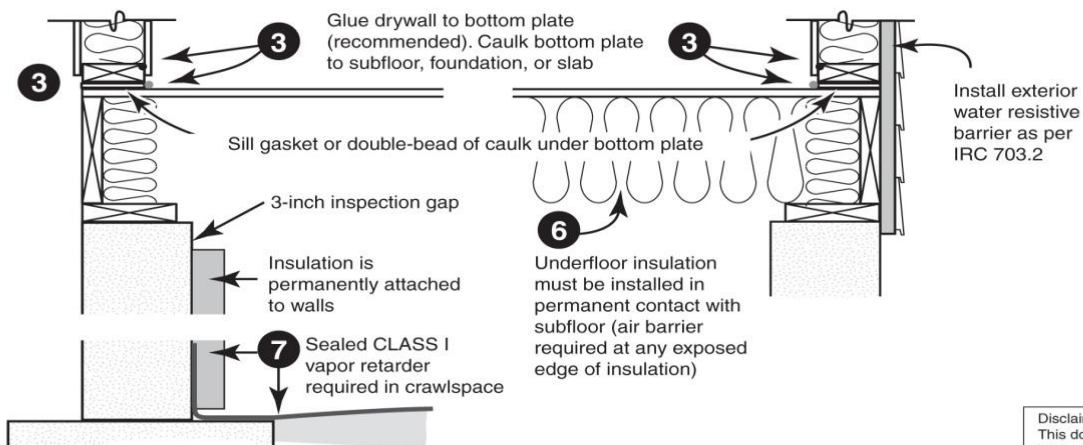
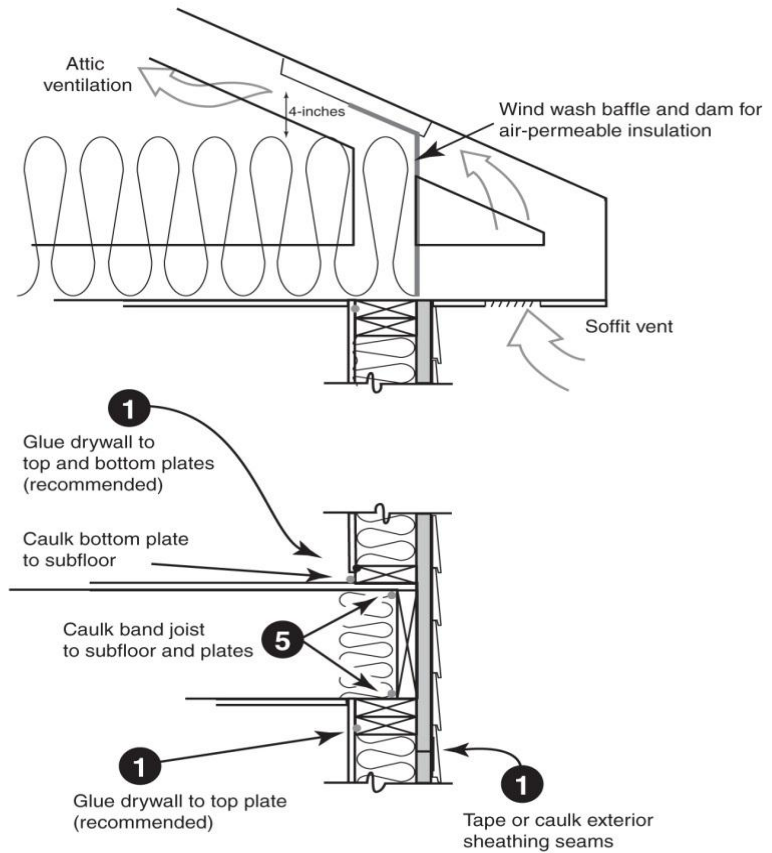
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Air Sealing Continued
Appendix
2009 IECC

Air sealing key points *continued*



Wall cross-section

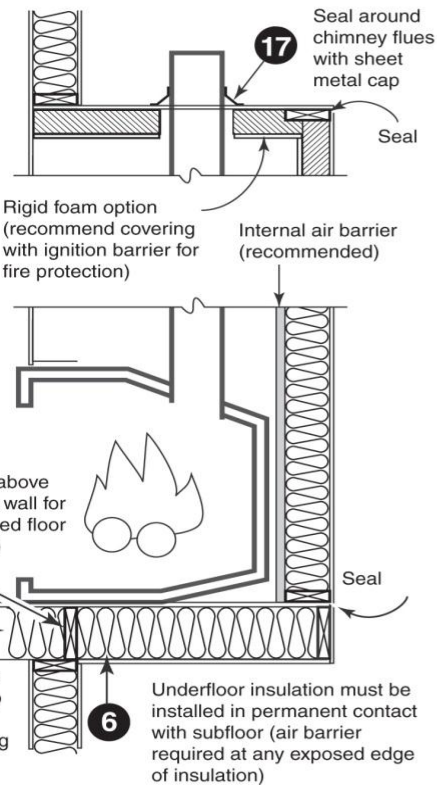


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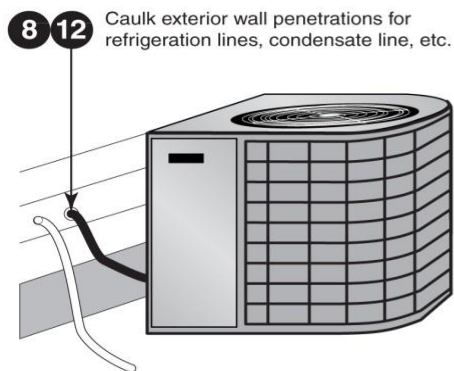
Air Sealing Continued
Appendix
2009 IECC

Air sealing key points *continued*

Combustion chase penetrations

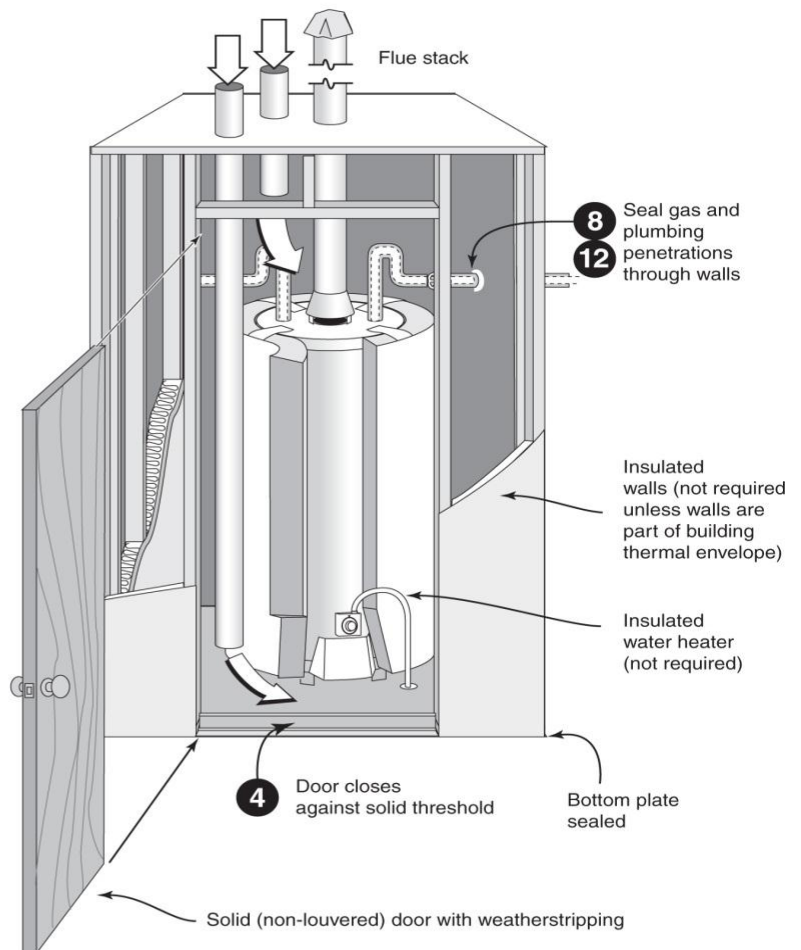


Exterior penetrations



Combustion closet

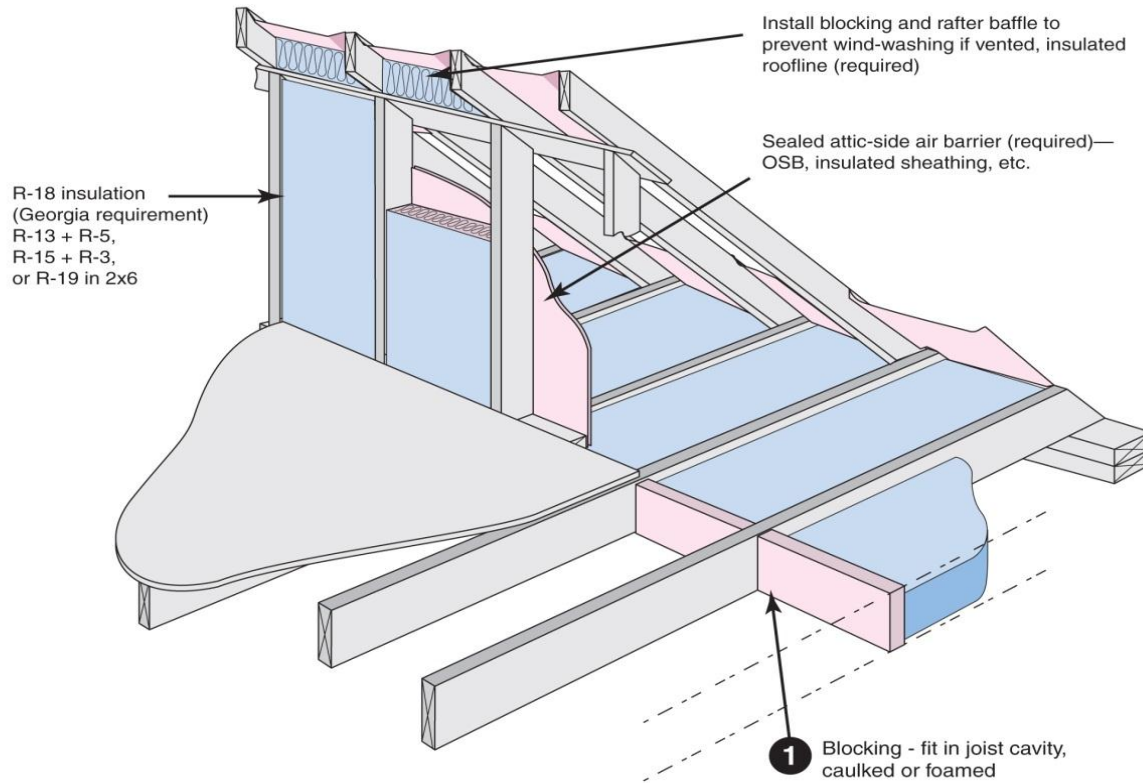
Combustion air inlets
as per mechanical and/or fuel gas code



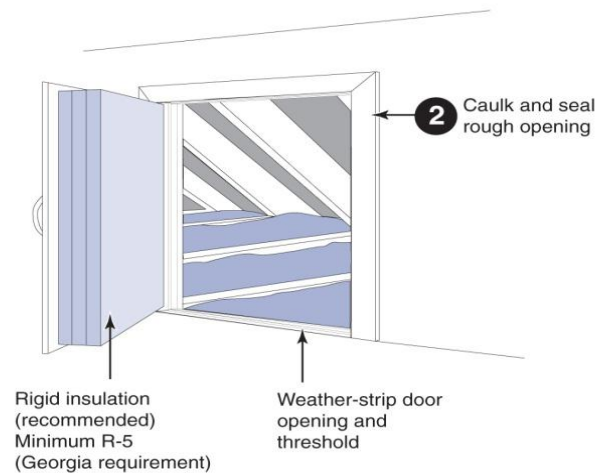
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Air Sealing Continued
Appendix
2009 IECC

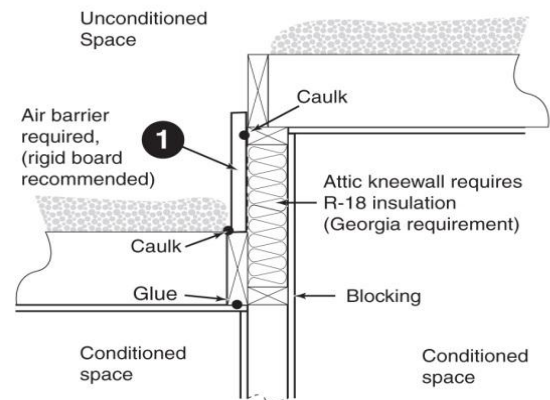
Air sealing key points *continued*



Attic knee-walls



Two-level attic

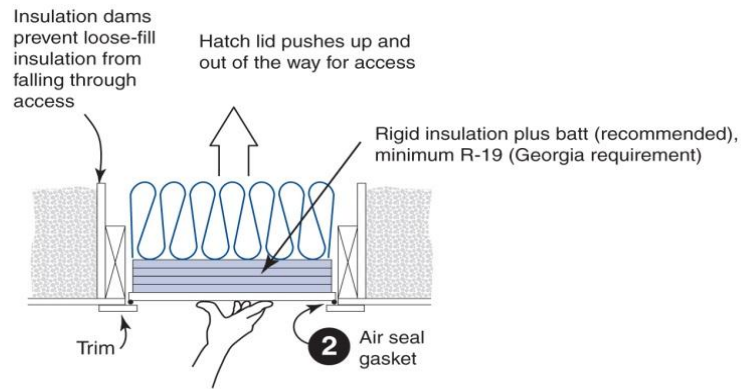


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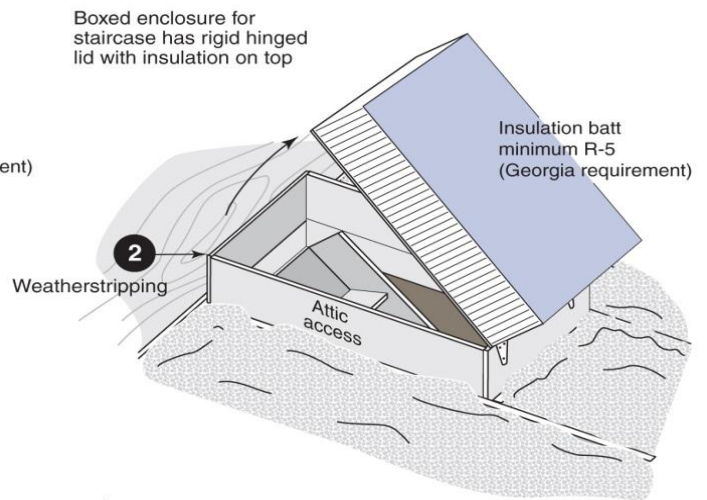
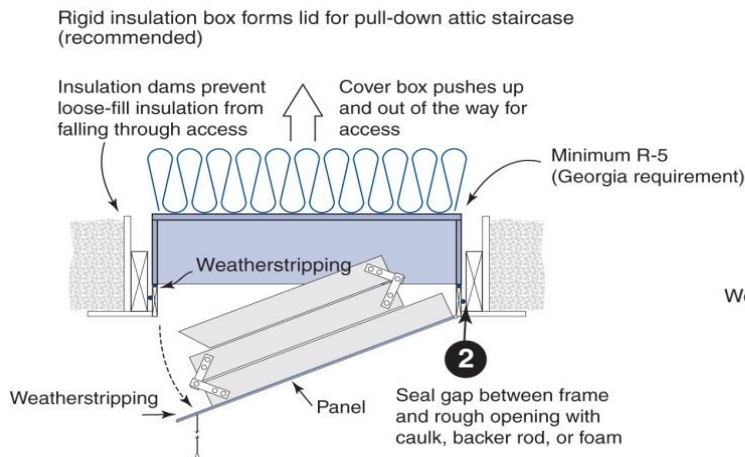
Air Sealing Continued
Appendix
2009 IECC

Air sealing key points *continued*

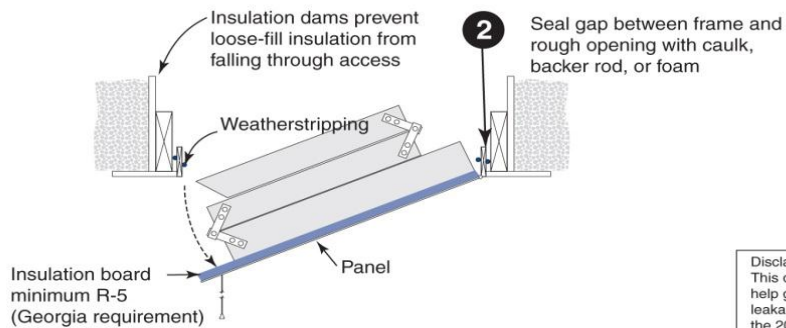
Attic scuttle



Attic pull-down stairs



Attic pull-down stairs

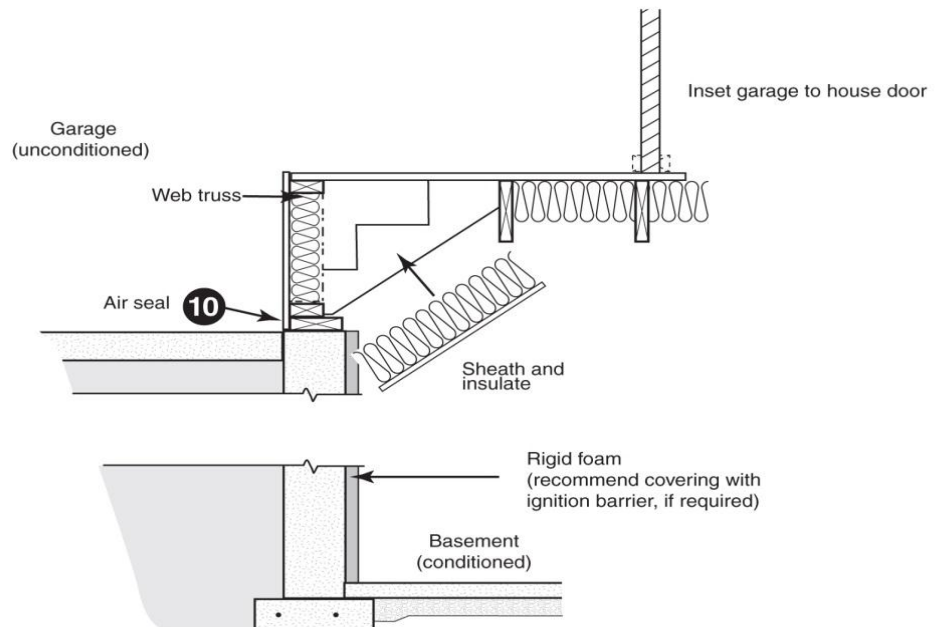
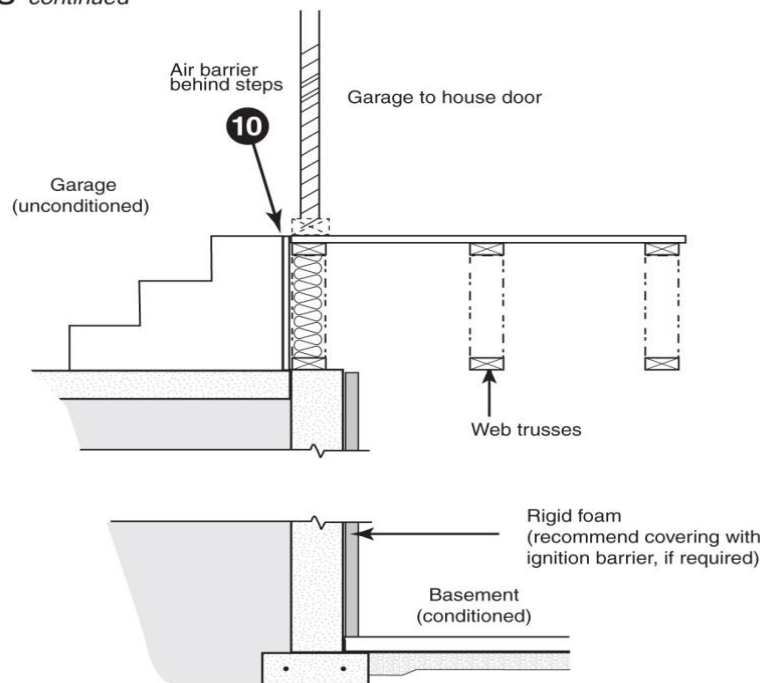


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Air Sealing Continued

Appendix
2009 IECC

Air sealing key points *continued*



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Insulation³

AR.1. Attic and Roof Insulation

1. Duct Insulation, Duct Sealing and Air Sealing

Accessible gaps and penetrations between conditioned space and attic space shall be sealed in compliance with Section AS – Air Sealing. Air sealing is not required if insulation is not installed.

All accessible ducts in unconditioned attic areas shall be sealed, supported, mechanically fastened, and insulated in compliance with Section D.1. – HVAC Duct Insulation & Sealing when installing attic insulation.

2. Attic Preparation and Debris

Degradable and absorbent scrap materials, especially wood and cardboard, shall be removed from the attic. The roof and attic shall free from water leaks and moisture damage prior to performing work.

3. Baffles for Eave and Soffit Vents

Eave and soffit vents shall be baffled to prevent air movement through the insulation and blockage of the vent; all insulation types shall comply with this requirement. Baffles shall maintain an opening equal to or greater than the size of the vent. Baffles shall be fastened to roof rafters with no less than 9/16-inch galvanized staples or roofing nails.

Baffles shall be rigid and air impermeable. All baffles shall extend at least 4 inches above the final level of insulation.

Where a continuous soffit vent exists, baffles shall be installed equally spaced along the length of the soffit and allow sufficient Net Free Area (NFA) of ventilation. Unbaffled bays that open to a soffit shall be blocked and sealed with a rigid moisture-resistant material so blown product is not able to enter soffit.

Baffle shall be installed far enough into the bay to reach the exterior side of the top plate.

4. Dams

Dams shall be installed between insulated and uninsulated areas, such as garages, covered porches and along the upper edge where ceilings differ in height, to keep loose-fill insulation from falling over the edge. To build dams, use batt-type insulation laid flat, with an R-value equal to that in the attic. The batt shall be at least 14-1/2 inches wide. Other acceptable dam materials would be plywood, rigid foam board or moisture-resistant cardboard. See specifications for damming attic accesses. Sloughing is not permitted.

5. Exhaust Ventilation Ducts & Dryer Ducts

Exhaust ventilation ducts and dryer ducts located in the attic shall comply with requirements in Section MV – Mechanical Ventilation.

6. Installation

- a) Ceilings shall be insulated to a minimum of R-38 or the highest R-value approaching R-38 which is practical.
- b) Uninsulated sloped ceilings between ventilated attics shall be insulated where practical. Airflow shall be maintained over the sloped-ceiling insulation by tubes, baffles, or by using rigid insulation; or the sloped-ceiling area may be insulated to the full cavity depth where local codes allow, provided installation meets requirements in Section 19 – Unvented Vaulted Ceilings insulation requirements.
- c) If exposed water pipes are located in the attic space, water pipe shall be insulated for freeze protection as specified in Section HW Hydronic and Water Pipe Insulation.

³ Source: Regional Technical Forum Residential Weatherization Specifications August 30, 2011

Insulation Continued

d) Enclosed attics and enclosed rafter spaces shall have cross ventilation for each separate space. Ventilating openings shall be protected against the entrance of rain and snow.

- The net free-ventilating area shall be not less than 1/150 of the area of the space ventilated, except that the area may be 1/300, provided no more than 60% of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated.
- If an attic vent is used as an exhaust duct termination it shall not be included in passive attic vent area calculations.
- Vent openings shall be covered with corrosion-resistant metal mesh with mesh openings of maximum 1/4 inch in dimension.
- The vent area shall be the NFA, defined as the actual open area of the vent after subtracting any area blocked by screens or louvers. All vents shall be screened.
- Air turbines shall not be installed in order to meet the ventilation requirements of these specifications; however, ventilating area of existing air turbines may be included by estimating the net free ventilating area of the air turbine in a locked, non-rotating position.

e) The UL label or equivalent label shall appear on every bag of loose fill cellulose material. It shall include the file number (R-number) of the manufacturer and the issue number for labels purchased. This ensures adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e., critical radiant flux, smoldering combustion, settled density, and corrosiveness).

7. Baffles for Light Fixtures, Fan/Lights, Fan/Heaters, Chimneys and Miscellaneous Heat Producing Fixtures

- a) Only fluorescent fixtures with rated thermal protection shall be covered with insulation.
- b) Recessed lighting fixtures and other heat producing fixtures that are Type-IC (Insulation Contact) rated by UL may be covered with insulation.
- c) Non-combustible baffles attached to the ceiling structure shall be used to maintain a 3" clearance around the perimeter of recessed lighting fixtures and other heat producing fixtures that are not Type-IC rated. Insulation shall not be installed directly above recessed lighting fixtures and heat producing combinations that are not Type-IC rated
- d) All combustible insulation materials, including existing insulation, shall be kept a minimum of 2 inches from metal flues and masonry chimneys. Non-combustible insulation (per ASTM E-136) may be installed with no clearance around flues and chimneys if permitted by local or State fire code. However, if the flue is a single wall type (i.e., made from a single thickness of rolled sheet metal) then, a 2-inch air clearance to all insulating materials shall be maintained.

8. Vapor Retarders

- a) If a vapor retarder is present, it shall be in contact with the surface between attic and conditioned space.
- b) New insulation with a vapor retarder shall not be installed on top of existing insulation.

9. Water Pipes in Attics

Water pipes located in the attic shall be insulated to meet requirements in Section HW –Hydronic and Water Pipe Insulation.

10. Interior Attic Access Doors

- a) Weather-stripping shall be permanently attached to create an effective air seal between the attic access frame and the door. Accesses with air leaks that cannot be weather-stripped shall be repaired or replaced prior to insulating. Ceiling accesses shall be insulated to at least R-30 with batt-type or rigid insulation. Alternatively, R-5 or greater rigid insulation installed between the access cover and a rigid protective material (Plywood or other durable rigid material) attached over the entire insulation area is allowed. Insulation must be sealed around the perimeter to the access cover using caulk, adhesive or spray foam. Access cover assembly must be tightly sealed using weather stripping around the entire perimeter.

Insulation Continued

- b) Batt-type insulation shall be attached to the door with twine. The twine shall be stapled to the edges of the door. Stapling the insulation directly to the door is unacceptable. Fibrous insulation must be covered with a vapor permeable air barrier material.
- c) Attic accesses shall be protected from having loose-fill insulation fall through the opening. The full level of ceiling insulation shall be maintained to the edge of the attic access opening by one of the following methods:
- I. The opening may be framed with wood or plywood boards. The framing shall be permanently attached and extend at least 4 inches above the final level of insulation. **Cardboard or foam board are not acceptable for attic access damming.**
 - II. A minimum 14-1/2-inch wide insulation batt laid flat, with an R-value equal to that specified for the attic, may be placed tightly around the perimeter of the access opening. This 14-1/2 inches shall be maintained in all outward directions from the access opening, including corners. Scoop out all loose-fill insulation from the edges before laying batts.

11. Pull-Down Stairs

Pull-down stairs in heated areas shall be weather-stripped and insulated to a minimum of R-10. Insulation and weather-stripping shall be installed to allow easy operation of the stairs. Factory or site built pull-down stair covers shall have a minimum R-10. New pull-down stair assemblies with a minimum R-5 insulation rating will be permitted provided the insulation is between conditioned space and the attic stair assembly and gaskets or weather-stripping prevent air infiltration.

12. Exterior Attic Access Doors

Any outside access shall have a door that is constructed for continuous exposure to exterior conditions.

13. Walls in Attic Areas

- a) All walls separating attics and conditioned space shall be insulated in order to maintain a consistent thermal boundary separating conditioned and unconditioned spaces as part of attic insulation.
- b) All penetrations through the wall shall be sealed with caulk or foam. Knee wall and skylight wall insulation shall be installed prior to installing ceiling insulation. Knee walls and skylight walls shall be insulated to a minimum of R-13 in a 2x4 cavity, and R-21 in a 2x6 cavity. When adding new insulation over existing insulation, the cavity shall be completely filled. Do not install new insulation with a vapor retarder on top of pre-existing insulation.
- c) Wall insulation inside attics, whether new or pre-existing, shall be covered with a durable, vapor permeable air barrier material to prevent air penetration of the insulation, and to ensure that the insulation is held in full contact with the wall cavity. The air barrier material shall be permanently fastened so that it supports the knee wall insulation.
- d) Knee wall accesses shall be insulated to R-13 and weather-stripped to create an effective air seal. If side attic area is used for storage, fibrous knee wall door insulation shall be covered to prevent human contact. Foam core doors with a minimum R-5 insulation rating (manufactured for exterior use) and used in knee wall access door installations will be permitted, provided gaskets or weather-stripping prevents air infiltration around the entire door perimeter.

14. Installing Loose-Fill Insulation

Loose-fill insulation shall be installed in contact with the surface between the conditioned space and attic with a uniform R-value. The number of bags used to attain the added R-value shall match manufacturer's estimated bag count. Baffles and dams shall be in place prior to installing loose-fill insulation.

15. Installing Batt-Type Insulation

Batts shall be installed in contact with the surface between the conditioned space and attic, cut to fit, placed tightly together with no gaps except those required for clearance around heat-producing fixtures. Compression at eave line is allowed. Where practical, place one layer of batts between the joists and another layer of batts on top of the first layer and

Insulation Continued

at right angles to the joists or offset to cover the seams of the first layer. Baffles and dams shall be in place prior to installing batt-type insulation.

16. Installing Foam Insulation

In an open attic flat, sloped cavity or attic knee walls, both spray or rigid foam are acceptable types of insulation, provided

- a) They meet the requirements for R-value;
- b) Are installed in contact with the surface between attic and conditioned space;
- c) Comply with thermal and ignition barrier code requirements for "foam plastics," as defined by the local building code.

17. Floored Attics

- a) Cavities below decked storage areas above conditioned space shall be insulated to the highest practical level.
- b) Insulation shall be installed under the boards of floored attics. To fill the cavities, the boards can be lifted or holes can be drilled into them no more than 4 feet apart. If loose-fill insulation is used, joist cavities shall be tightly packed with insulation.
- c) Areas with loose-fill insulation next to a floored attic shall be dammed to prevent insulation from falling onto the floored attic.

18. Vented Vaulted Ceilings

If insulation is added to a vented vaulted ceiling, a 1-inch air space shall be maintained above the insulation. Each cavity shall have an upper and lower vent.

19. Unvented Vaulted Ceilings

Unvented vaulted ceilings are allowed using:

- a) Tightly packed fibrous insulation (i.e. fiberglass, cellulose, etc.) provided all applicable requirements in Section AR.1 are met and all of the following conditions are met:
 - I. The insulated vaulted ceiling is less than 8 feet in length
 - II. The insulated vaulted ceiling is located between upper (peak) and lower (rake) ventilated attic spaces provided containment materials used at the lower and upper cavity openings allow for rapid vapor diffusion
 - III. A continuous and seamless air barrier is located between the conditioned space and insulation
 - IV. All recessed fixtures in the insulated assembly shall be UL rated for Insulation Contact Air-Tight (ICAT)
 - V. Each unconditioned attic area shall be provided with venting
- b) Air-impermeable insulation (i.e. spray foam or other material as defined in International Residential Code) provided all applicable requirements in Section AR.1 are met and all of the following conditions are met:
 - I. Installation meets all manufacturer installation requirements and all requirements listed in product specific ICC-Evaluation Service Report
 - II. Full program required R-value shall be installed where space allows
 - III. Air-impermeable insulation shall be a vapor retarder or a vapor retarder shall be installed in direct contact with the underside of the insulation
 - IV. All recessed fixtures in the insulated assembly shall be UL rated for ICAT
 - V. Each unconditioned attic area shall be provided with venting

20. Interior Roof Insulation

- a) The installation of interior roof insulation shall comply with Section 19b.
- b) Roofs shall be insulated to a minimum of R-24 or the highest R-value approaching R-24 which is practical.

Insulation Continued

c) An in-progress inspection shall be performed by the Utility after the rigid board has been installed and prior to covering the insulation to verify the insulation board is properly installed and sealed. The in-progress inspection shall be documented in the house permanent file. Utility may allow photographs in lieu of an in-progress inspection.

21. Exterior Roof Insulation

- a) Roofs shall be insulated to a minimum of R-20 or the highest R-value approaching R-20 which is practical.
- b) Insulation shall not be applied to roofs over ventilated cavities. (e.g., vaulted ceilings with ventilated spaces, attics, sloped ceilings connected to attics and/or knee wall spaces, etc.) Ventilated cavities of flat or sloping roofs shall not be blocked.
- c) Insulation shall be in a rigid board form.
- d) Roof drainage systems shall function after insulation is installed.
- e) Recessed lights in insulated cavities shall be Insulation Contact and Air Tight (ICAT) rated.
- f) All penetrations through the roof covering and all joints between the roof covering and vertical surfaces (e.g., walls, chimneys, etc.) shall be flashed and sealed.
- g) An in-progress inspection shall be performed by the Utility after the rigid board has been installed and prior to covering the insulation to verify the insulation board is properly installed and sealed. The in-progress inspection shall be documented in the house permanent file. Utility may allow photographs in lieu of an in-progress inspection.

WI.1. WALL INSULATION

1. Unfinished Walls

- a. Applies to Exposed Frame Wall, Concrete, or Masonry Walls
- b) Walls shall be insulated to a minimum of R-13 for nominal 4 inch walls and to a minimum of R-21 for nominal 6 inch walls.
- c) Above grade, vapor diffusion retarders shall be installed when practical. Vapor retarders installed as part of wall insulation shall have a perm rating of 1.0 or less and shall be located between the insulation material and the Conditioned Space.
- d) Vapor retarders shall not be installed over fiberglass batt insulation on below grade wall applications. Fiberglass insulation shall not be installed in contact with below-grade concrete walls.
- e) When rigid insulation is applied to the exterior stud surfaces of an open cavity frame wall, the insulation shall be installed tightly to minimize air leakage and an adequate air/vapor retarder shall be installed at the warm side of the insulation.
- f) Upon completion of exterior surface retrofits, the exterior wall shall be weather-tight with window and door jambs extended or modified to provide adequate drainage. Siding shall be installed per insulation or siding manufacturer instructions or as approved by the Utility.

2. Exterior Wall Cavities

- a) All cavities in all exterior walls shall be completely filled, and insulated to the highest practical R-value, including small cavities above, below and on the sides of windows and doors. Any damage to interior walls resulting from wall insulation installation shall be repaired.
- b) Insulation shall not be installed in wall cavities that serve as air ducts for heating or cooling. Cavities containing wall-mounted heaters shall not be insulated, unless there is blocking (with photographic documentation) to prevent contact with insulation.
- c) Insulation may be installed in wall cavities that are:
 - I. 3-1/2 inch deep or greater with 1 inch or less of existing insulation; or
 - II. less than 3-1/2 inch deep with no existing insulation.
- d) Fibrous blown-in insulation material shall be installed using the insert tube method. Foams shall be installed according to manufacturer specifications.

e) The entire stud bay shall be filled, including cavities requiring more than one hole due to blocking in the cavity.

Insulation Continued

f) Stud bays containing supply plumbing may be left uninsulated to prevent freezing.

g) When access holes for installing the insulation are drilled through the interior wall or finish siding and sheathing, the Utility shall verify that all holes were adequately plugged and provide a tight weatherproof seal.

I. Plugs shall be sealed, weatherproofed and ready to paint. Plugs shall not be vented. Plugs shall be made of material that will not shrink or expand, which would result in damage to the siding or finish. If the surface of the plug is below the surface of the siding, the hole shall be filled with non-shrinking filler. If siding is removed and holes are drilled in the sub-siding, the holes shall be plugged.

h) The UL label or equivalent label shall appear on every bag of loose fill cellulose material. It shall include the file number (R-number) of the manufacturer and the issue number for labels purchased. This ensures adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e., critical radiant flux, smoldering combustion, settled density, and corrosiveness).

i) Only non-combustible insulation (per ASTM E-136) shall be installed in wall cavities adjoining fireplaces and/or chimneys.

j) Insulation shall not be installed in wall cavities which contain electric space heaters unless fire stops are present which isolate the heater from all contact by the insulation material. Verification shall be accomplished by removal of the heater after the insulation is installed or from photographs from installation contractor.