

## WHY HOME IMPROVEMENT EXPERT?

An easy way to get a quality job.

Research findings reveal significantly reduced energy savings and potential performance risks where home improvements are not properly installed. To help homeowners address this challenge, the U.S. Department of Energy has compiled world-class expert guidance from industry leaders and national laboratories in factsheets and checklists under the name **Home Improvement Expert**. Homeowners can leverage these expert recommendations to help ensure quality installation by attaching Home Improvement Expert checklists to vendor contracts and ensuring the vendor completes and signs the checklist before accepting the work.

## READY TO DO MORE?

This factsheet and accompanying checklist cover one of more than 20 home improvements covered by the U.S. Department of Energy Home Improvement Expert. Use them to help optimize energy savings and improve performance related to comfort, health, safety, and durability.

To download other checklists: [bascc.pnnl.gov/home-improvement-expert](http://bascc.pnnl.gov/home-improvement-expert)

For more customized home improvement recommendations:

- Get your **Home Energy Score** from a qualified assessor ([www.home-energy-score.gov](http://www.home-energy-score.gov))
- Schedule an expert assessment through **Home Performance with ENERGY STAR®** ([www.energystar.gov/homeperformance](http://www.energystar.gov/homeperformance)).



## BENEFITS

Converting an attic from vented to unvented can reduce utility costs while improving comfort, indoor air quality, and durability.

An unvented attic is air sealed and insulated at the sloped roofline instead of at the attic floor. As a result, the attic becomes part of the conditioned space of the home. This protects heating and cooling equipment and ductwork located in the attic from temperature extremes so it will last longer and operate more efficiently. An unvented attic also helps reduce potential moisture problems by keeping out humid outside air and wind-driven rain. Additionally, the conditioned attic can provide climate-controlled storage space or could potentially be converted to bonus living space if the structural support is in place. As an added benefit, an unvented attic can be designed to be more resistant to high-wind damage and to block fire-starting embers that originate from outside.

## RELATED HOME IMPROVEMENT CONSIDERATIONS

Before converting your attic from vented to unvented, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- testing for adequate combustion air for atmospherically vented combustion equipment (e.g., furnace, boiler, or water heater);
- integration of fresh air into the HVAC to provide ventilation;
- installation of kitchen and bath fans to remove moisture, odors, and stove emissions;
- testing of radon levels in high-risk radon zones identified;
- installation of structural improvements to make the attic more resistant to high winds.

For more information on attics, please search the Building America Solution Center, [bascc.pnnl.gov](http://bascc.pnnl.gov).

## TIPS FOR HIRING A CONTRACTOR

- Look for licensed, insured, and certified contractors.
- Check references and reviews on home improvement web sites.
- Get multiple bids in writing.
- Check with your utility and state, local, and federal weatherization programs for rebates and incentives.
- Include the Home Improvement Expert™ checklist in bids and contracts to ensure quality installation.
- Consider using a Residential Energy Services Network (RESNET) certified Home Energy Rating System (HERS) rater, Building Performance Institute (BPI) certified Building Analyst, or other qualified professional (e.g., licensed engineer or architect) to inspect the work.

**ENCLOSURE UPGRADES**

Attic Air Sealing and Insulation

Basement Wall Insulation

Framed Wall Insulation

Masonry Wall Insulation

Home Air Sealing

Vented to Unvented Attic

Vented to Unvented Crawl Space

Window Replacement

**HEATING & COOLING**

Air Conditioner Replacement

Gas Furnace Replacement

Heat Pump Replacement

Duct Sealing and Insulation

Oil or Gas Boiler Replacement

**HOT WATER HEATING**

Gas Tank Water Heater

Gas Tankless Water Heater

Heat Pump Water Heater

**FRESH AIR SYSTEM**

Bathroom Exhaust Fan

Kitchen Exhaust Fan

Balanced HRV/ERV

Balanced Supply plus Exhaust

Supply Integrated with HVAC

**PROPER SEQUENCING OF HOME IMPROVEMENTS**

Through the U.S. Department of Energy's Building America research program, expert guidance has been developed for optimizing whole-house energy-efficiency upgrades. This includes a recommended sequence for home improvements (shown below) to help ensure homeowners get the most out of their upgrade investments while minimizing potential harm from safety, indoor air quality, and moisture issues.

**STEP 1: ENSURE SAFE AND DURABLE**

Have experts assess opportunities to improve energy efficiency and identify comfort, moisture management, health, and safety issues.

**STEP 2: ENSURE FRESH AIR**

Ensure effective ventilation before increasing air tightness.

**STEP 3: ENSURE MOISTURE CONTROL**

Ensure adequate water protection before reducing the ability of walls to dry by adding air sealing and insulation.

**STEP 4: ENSURE DRAFT-FREE**

Capture air sealing opportunities not accessible after insulation is installed.

**STEP 5: ENSURE THERMAL COMFORT**

Insulate at least to the latest national code recommendations for your location after addressing related safety, indoor air quality, and moisture management issues.

**ANYTIME: EQUIPMENT UPGRADES**

Replace heating and cooling equipment, water heaters, windows, appliances, lighting, fans, and electronics when they fail or become out of date with ENERGY STAR® qualified products or better, and improve systems to operate more efficiently.



This U.S. Department of Energy checklist includes important specifications that can contribute to a complete and quality installation. All work shall comply with these specifications, all relevant codes and standards, and all manufacturer installation instructions. The contractor shall check each box on the checklist below and sign and date at the bottom to certify the work is completed.

## PREPARATION

<input type="checkbox"/>	The attic shall be inspected for water leaks and moisture, structural, or pest damage. A list of all needed repairs shall be provided to the homeowner before air sealing work begins so remediation can be fully addressed as necessary.
<input type="checkbox"/>	If there is active knob-and-tube wiring present in the attic, insulation shall not be installed until the wiring is replaced with modern wiring. If the knob and tube wiring will remain, it should be properly boxed and it must remain accessible. If the wiring is in the way of properly air sealing and insulating the underside of the roof deck, then it must be moved.
<input type="checkbox"/>	Work shall not proceed if existing insulation is vermiculite, which may contain asbestos.
<input type="checkbox"/>	If there is a vapor retarder on the attic floor, it shall be removed to allow any moisture that builds up in an unvented attic to diffuse into the house below.
<input type="checkbox"/>	All openings that exist to ventilate the attic, including ridge vents, gable vents, and soffit vents shall be closed off and sealed and new roofing installed as needed.
<input type="checkbox"/>	All wood-to-wood framing joints and penetrations exposed to exterior conditions shall be sealed.
<input type="checkbox"/>	Any existing whole-house fan shall be removed or disabled and the drywall ceiling opening shall be fully patched and refinished to match the existing ceiling.
<input type="checkbox"/>	Care shall be taken not to block, remove, or disable kitchen or bathroom fan exhaust vents, water heater or furnace flues, radon vent pipes, and plumbing vent pipes. All exhaust fans shall be modified to vent to the outside, not into the attic.

## INSTALLATION: AIR SEALING ROOF SHEATHING AND GABLE WALLS

<input type="checkbox"/>	All sealants used shall be compatible with their intended surfaces and meet fire rating requirements around flues. Maximum gap dimensions shall be consistent with sealant manufacturer's specifications.
<input type="checkbox"/>	A continuous seal consisting of sprayer-applied caulk, liquid membrane coating, mastic, spray foam, and/or equivalent shall be applied at seams, cracks, joints, and edges, and around all penetrations and vents at all roof sheathing and vertical gable walls to the exterior.

## INSTALLATION: INSULATING THE SLOPED ROOF AND GABLE WALLS

<input type="checkbox"/>	Insulation shall be installed at all roof surfaces and gable wall surfaces adjoining the exterior at levels that meet or exceed prescriptive levels specified by the 2012 International Energy Conservation Code (IECC) and with less than 2% gaps, voids, and compression. Note: the insulation value at the gable walls shall meet or exceed 2012 IECC prescriptive requirements for above-grade walls in the home's location.
<input type="checkbox"/>	All International Residential Code (IRC) requirements for air-permeable and air-impermeable insulation at the roof sheathing shall be fully met.
<input type="checkbox"/>	All IRC code requirements for a fire ignition barrier at the insulation surface exposed to the attic shall be fully met.



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### RESILIENCE RECOMMENDATIONS

- Two-part closed-cell polyurethane spray foam is recommended at all points where roof decking meets rafters and at seams in the roof deck because this can increase the ability of the roof to resist uplift from high winds by up to 300%.
- Since gable end walls are vulnerable to collapse in high-wind events, it is recommended that two-part closed-cell polyurethane spray foam be applied to improve structural performance. Additional guidance on reinforcement can be found in FEMA documentation.

### COMMISSIONING

- HVAC supply and return air flow to the attic shall be provided at a rate of 1 CFM/50 ft<sup>2</sup> of attic floor area. HVAC system capacity shall be increased if needed, especially if increasing the amount of living space.
- The home shall be inspected for the presence of a whole-house ventilation system. If one is present, the actual air flow shall be tested and verified to meet a target ventilation rate based on house size as follows: 50 cfm for up to 1,500 ft<sup>2</sup>, 70 cfm for 1,501 to 2,500 ft<sup>2</sup>, and 100 cfm for over 1,500 ft<sup>2</sup>. If the home has no whole-house ventilation system, or if the existing system does not meet the target ventilation rate, recommendations shall be made to the homeowner to either install a new system or repair the existing system to meet the target ventilation rate.
- At the completion of the work, a radon test kit shall be provided to the homeowner with a recommendation to initiate a radon remediation strategy if post-retrofit radon measurements exceed EPA acceptable levels.

I hereby certify that, to the best of my knowledge and ability, all checked items on the above checklist have been accomplished as part of completion of this home upgrade.

Contractor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Contracting Organization: \_\_\_\_\_

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