

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: basc.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)
- Schedule an expert assessment through **Home Performance with ENERGY STAR®** (www.energystar.gov/homeperformance).



BENEFITS

Installed correctly, home air sealing can reduce utility costs while improving comfort, indoor air quality, and durability.

There are extensive holes, cracks, and missing air barriers in older homes that allow unwanted heat loss in cold weather, heat gain in hot weather, and infiltration of contaminants year-round. Air sealing uncontrolled leaks is one of the most cost-effective measures to improve your home's performance. It can reduce your heating and cooling bills, improve comfort by reducing drafts, keep contaminants such as moisture, dust, pollen, and pests from entering your home, and reduce moisture-related durability problems.

RELATED HOME IMPROVEMENT CONSIDERATIONS

Before air sealing your home, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- testing for adequate combustion air with natural draft combustion equipment (e.g., furnace, boiler, and water heater) to ensure safety;
- integration of fresh air into the heating and cooling system to provide ventilation;
- installation of exhaust fans in bathrooms to remove moisture; and
- installation of an exhaust fan in the kitchen to remove cooking emissions.

For more information on air sealing, please search the Building America Solution Center, basc.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

Comprehensive Attic Upgrade

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"/> | A general inspection of the home for water leaks and moisture, structural, and pest damage shall be performed. 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"/> | Before work is performed, air tightness shall be tested with a blower door test according to the Residential Energy Network (RESNET) Standards for Air Leakage Testing. Based on the pre-test, a targeted level of air tightness shall be determined and provided to the owner. |
| <input type="checkbox"/> | A combustion safety test shall be performed if any natural draft combustion equipment exists in the home to ensure there is no backdrafting or spillage of combustion fumes. Any combustion safety issues shall be addressed before proceeding with air sealing. |

INSTALLATION

- | | |
|--------------------------|--|
| <input type="checkbox"/> | All accessible gaps, cracks, seams, and penetrations between conditioned and unconditioned space (such as gaps around lighting fixtures, HVAC duct boots, electric wiring, plumbing pipes, and flues) shall be sealed with sealants alone (e.g., caulk, foam, aerosol sealant) if the gaps are narrow enough or, for larger gaps, with rigid blocking material sealed in place with sealants, per the sealant the manufacturer's instructions. Fibrous insulation is not an air barrier and shall not be used for air sealing. |
| <input type="checkbox"/> | The seams where drywall attaches to the top plate at all accessible interior and exterior walls shall be sealed from the attic side with a caulk, spray foam, or sprayer-applied sealant. |
| <input type="checkbox"/> | Larger gaps and openings (such as uncovered dropped soffits and openings under knee walls or at the tops of balloon-framed gable walls) shall be closed off using a solid material such as rigid foam or OSB that is sealed at the edges with caulk, sealant, or mastic. |
| <input type="checkbox"/> | Gaps around masonry chimneys or gas appliance vents shall be sealed with high-temperature-rated caulk or foam in accordance with building code requirements. |
| <input type="checkbox"/> | A continuous gasket, such as weather stripping, shall be installed around all exterior door openings. |
| <input type="checkbox"/> | Indoor sealants shall be low volatile organic compound (VOC) products that meet independent testing and verification protocols, such as Green Seal, GREENGUARD, or comparable certifications. |



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COMMISSIONING

<input type="checkbox"/>	After air sealing, a combustion safety test shall be performed if any natural-draft combustion equipment (e.g., water heater, furnace) exists in the home to ensure there is no back-drafting or spillage of combustion gases. Recommendations for remediation shall be made to the homeowner where combustion safety issues are identified.
<input type="checkbox"/>	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 ² , 70 cfm for 1,501 to 2,500 ft ² , and 100 cfm for over 1,500 ft ² , per ASHRAE 62.2-2013. If the home has no whole-house ventilation system, or if the existing system does not meet the target ventilation rate, recommendation shall be made to the homeowner to either install a new system or repair the existing system to meet the target ventilation rate.
<input type="checkbox"/>	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.
<input type="checkbox"/>	Air tightness shall be tested with a blower door test according to RESNET Standards for Air Distribution Leakage Testing after air sealing is performed and results shall be provided to the owner to verify that air tightness levels meet or exceed the target 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: _____

THE U.S. DEPARTMENT OF ENERGY DOES NOT WARRANT OR ENDORSE THE WORK, PRODUCTS, OR SERVICES OF ANY OF ITS PARTNERS.

