



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, basement wall insulation can cut your utility bills, make your home more comfortable, and increase its value.

Older homes without effective basement wall insulation allow excessive heat loss in winter and heat gain in summer. Insulating walls is a highly effective way to improve your home's performance. The optimum location for basement wall insulation is on the exterior; however, this is typically impractical for existing homes. If the inside face of the basement walls is exposed concrete, spray foam or rigid foam can be applied directly to the concrete then covered with furring strips and drywall or a framed wall filled with additional insulation. Foundation walls that are already covered with framing and insulation can be left as is if there is no evidence of moisture in the walls. If an inspection reveals moisture in the wall cavities, the drywall and existing insulation should be removed and the source of moisture remediated before insulating the walls with spray foam or rigid foam.

RELATED HOME IMPROVEMENT CONSIDERATIONS

Before insulating your basement walls, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. They will check for:

- required combustion air for any natural draft combustion equipment (e.g., if the home has a natural draft furnace, boiler, or water heater);
- integration of fresh air into the heating and cooling system to provide ventilation;
- installation of kitchen and bath fans to remove moisture and odors.

For more information on basement wall insulation, 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"/>	The basement shall be inspected for any evidence of asbestos, lead paint, bulk water penetration, moisture, or pest damage, and a list of any potential problems shall be provided to the homeowner before proceeding with the work so remediation can be fully addressed as necessary.
<input type="checkbox"/>	Doors from the basement to the outside shall be replaced with minimum R-5 insulated doors that are fully weather-stripped.
<input type="checkbox"/>	A continuous sealant (e.g., caulk, foam, or aerosol sealant) compatible with its intended surfaces and maximum gap dimensions shall be applied to all exposed rim joist and basement wall cracks, seams, or holes including where the basement wall meets the sill plate, where the sill plate meets the rim joist, and where the rim joist meets the subfloor.

INSTALLATION: OPTION 1 - UNFINISHED BASEMENT INSULATION

<input type="checkbox"/>	All rim joists adjoining the exterior shall be insulated directly against the rim joist with closed-cell spray foam and/or rigid insulation board to an R-value that meets or exceeds the prescriptive levels specified by the 2012 International Energy Conservation Code for the home's location. If only rigid insulation board is used, seams shall be fully sealed with caulk, foam, mastic paste, or flashing tape specified acceptable by the rigid insulation manufacturer. Fiberglass batts can be used if the rim joist is sealed prior to batt installation. Fiberglass batt shall be covered with a code-approved ignition barrier of fire rated assembly.
<input type="checkbox"/>	Basement walls shall be insulated with either spray foam or rigid foam insulation panels.
<input type="checkbox"/>	If using spray foam, a steel or treated-wood stud wall shall be constructed 2 inches away from the basement wall. (The space allows complete coverage of the wall and reduces thermal bridging.) High-density closed-cell or medium-density open-cell foam shall be sprayed directly on the entire surface of all basement walls adjoining the exterior.
<input type="checkbox"/>	Any exposed non-fire-rated spray foam or rigid foam insulation shall be covered with a code-approved ignition barrier or a fire-rated assembly such as ½-inch drywall.
<input type="checkbox"/>	If drywall is installed, it shall be at least ½ inch off the floor to help protect against potential moisture problems.
<input type="checkbox"/>	If using rigid foam insulation panels, they shall be attached to the interior of the basement wall with construction adhesive applied in a serpentine pattern. When using two layers of foam, stagger the seams. These panels shall completely cover all basement wall surfaces exposed to the exterior with no air gap between them and shall be fully in contact with the masonry wall, with no gaps. Panel seams shall be fully sealed with caulk, foam, mastic, or flashing tape specified as acceptable by the rigid foam manufacturer.
<input type="checkbox"/>	If using rigid foam insulation panels, furring strips shall be installed to create a nailing surface for the drywall.



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INSTALLATION: OPTION 2 - FINISHED BASEMENT INSULATION

- If the basement walls are already covered with framing and insulation, the cavity walls shall be inspected for moisture. If no evidence of moisture is found, the walls shall be left as is. If evidence of moisture is found, or if higher insulation levels are desired, the existing cavity wall shall be removed and any sources of moisture remediated.
- The walls shall be insulated with spray foam or rigid foam with an R-value that meets or exceeds the prescriptive levels specified by the 2012 International Energy Conservation Code for the home's location.
- A new insulated frame wall shall be installed.

COMMISSIONING

- A combustion safety test in accordance with ANSI/ACCA 12 QH Appendix A or RESNET Chapter 8 shall be performed if any natural draft combustion equipment (e.g., water heater, furnace) exists in the basement to help ensure there is no back-drafting or spillage of combustion emissions. Recommendations for remediation shall be made to the homeowner where combustion safety issues are identified.

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.

