

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.

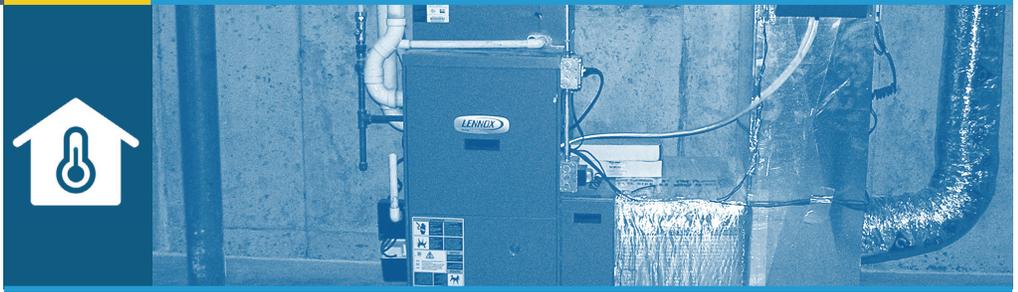
READY TO DO MORE?

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, a new gas furnace can cut utility expenses while improving comfort.

Systems for heating and cooling your home cost more money and use more energy than any other system in your home – typically over 50% of your utility bill. High-efficiency gas furnaces such as two-stage and modulating systems save energy and last longer. However, a quality installation is integral to a well-performing system. Nearly half of all heating and cooling systems in U.S. homes are not installed to manufacturer's instructions and therefore perform below rated capacity and efficiency.

RELATED HOME IMPROVEMENT CONSIDERATIONS

Before purchasing a gas furnace, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- selection of two-stage or modulating equipment that can better adapt to significantly reduced heating and cooling loads when insulation and air sealing upgrades are planned;
- integration of fresh air into the heating and cooling system to provide ventilation; and
- integration of high-capture filters in the return duct to more effectively remove particulates from the air you breathe.

For more information on furnaces, 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

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

- All exposed ducts (e.g., attic, basement, and crawlspace) shall be inspected; all damaged or disconnected ducts shall be repaired or replaced, and all visible leaks shall be sealed with UL 181 tape and/or mastic.
- A room-by-room load calculation shall be performed as described in the Air-Conditioning Contractors of America (ACCA) Manual J.
- The gas furnace selected shall be ENERGY STAR certified and sized in accordance with ACCA Manual S based on ACCA Manual J load calculation results.
- The system shall be evaluated to determine if the supply and return air flows are balanced and if ducts are properly sized.
- Recommendations shall be made to the homeowner if the ducts are not the right size.

INSTALLATION

- All equipment shall be installed in accordance with ANSI/ACCA Standard 5 HVAC Quality Installation Specifications.
- Correct air flow through the furnace, firing rate, and temperature rise shall all be verified.
- The air filter shall be replaced with a MERV 8 or higher filter selected for appropriate air flow across the coil.
- If the air filter is installed in a filter box attached to the air handler, the filter access panel shall be fitted with a flexible, air-tight gasket.
- Where a new thermostat location is provided, it shall be located on an interior wall away from heating or cooling registers, appliances, lighting fixtures, exterior doors, skylights, windows, and areas that receive direct sunlight or drafts.
- If installing a direct-vent gas furnace results in an orphaned gas water heater still connected to an existing chimney that may now have inadequate draft to remove the water heater combustion emissions, the contractor shall inform the homebuyer of necessary remediation steps (e.g., installing a chimney liner) to provide proper venting and code compliance.
- If installation of a new furnace results in a vacated entry point in the chimney, the hole in the chimney wall shall be sealed.

COMMISSIONING

- Pressure balance testing (pressure pan and/or flow hood) for proper room-to-room air flow shall be performed and adjustments shall be made to address any imbalances.
- Air flow across the coil shall be tested following procedures approved by ANSI/ACCA Standard 5 QI-2015 to verify it is within the CFM range specified by the equipment manufacturer. If it is not, adjustments shall be made as required.
- 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 or exceed a target ventilation rate based on house size as follows: 50 cfm for up to 1,500 ft², 70 cfm for 1,501 to 2,500 ft², and 100 cfm over 2,500 ft², per ASHRAE 62.2-2013. Recommendations shall be made to the homeowner for either installing a new whole-house ventilation system compliant with the target rate if one is not present or repairing an existing system to be compliant with the target rate if airflow is not adequate.

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.