

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 whole-house fresh air system helps ensure a healthier indoor environment.

Contaminants in homes can trigger asthma and allergy attacks as well as other health problems. Whole-house fresh air systems effectively dilute, exhaust, and filter these contaminants. Balanced systems provide effective ventilation by bringing fresh air into the home through dedicated fresh air ducts equipped with filters rather than through unknown sources like cracks in the building envelope. This intake air is balanced with electronically controlled exhaust fans to maintain even air pressures throughout the home. Electronic controls are used to operate the air handler fan of the central heating and cooling system to periodically draw a set amount of fresh air into the home throughout the day, even when the thermostat is not calling for heating and cooling.

RELATED HOME IMPROVEMENT CONSIDERATIONS

Before purchasing a balanced whole-house fresh air system, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- Duct sealing to ensure effective whole-house ventilation when existing heating and cooling ducts are used to distribute fresh air;
- kitchen exhaust fans that remove contaminants, moisture, and odors;
- integration of fresh air and high-capture filters in the heating and cooling system to provide ventilation and more effectively remove particulates from the air you breathe.

For more information on ventilation, 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

- The flow rate of any existing bath exhaust fans shall be tested. If the flow rate does not meet the target ventilation rate specified below, if fan noise is excessive, or if a bath fan is not present, a bathroom exhaust fan shall be installed according to the Home Improvement Expert Checklist: Bathroom Exhaust Fan.
- For continuous operation, the target ventilation rate for the home shall be 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. For intermittent operation, the average air flow shall meet the minimum target ventilation rate specified above (e.g., if the controller operates the air handler fan for a minimum of 20 minutes each hour, then three times the target ventilation air flow is needed).
- An outdoor air intake location shall be selected that is close to the return plenum of the central air handler and will provide a short, straight, unobstructed path from the air intake to the return plenum to provide unrestricted airflow. The equivalent length of the duct run should be as short as possible. "Equivalent length" shall be calculated in accordance with ANSI/ACCA Manual D Residential Duct Systems.
- The air intake shall open to the outdoors, not to an attic, basement, garage, or crawlspace. The location shall be away from garages or parking areas; at least 10 feet from any exhaust termination; and accessible from the ground for cleaning and maintenance, but well above the regionally specified snow level. The air intake shall be equipped with an air filter that is MERV 11 or better. The pressure drop across the filter shall be measured and verified to match equipment capabilities.
- If the HVAC air handler has a PSC motor, it should be replaced with a variable-speed ECM or BPM motor.
- A controller shall be selected that is compatible with the existing air handler and control system.

INSTALLATION

- Outdoor air intakes shall be equipped with screens to keep out insects and debris, integrated with siding and flashed properly to prevent water intrusion, and caulked at the exterior wall or ceiling to limit the infiltration of exterior air into the home.
- The balancing damper and the controller shall be adjusted so that the specified amount of outdoor air is introduced into the system at the desired schedule.
- The outside termination of any exhaust ducts shall be covered with louvers, a screen, or a grille.
- All duct seams and connections shall be sealed with mastic or UL 181 tape.
- Ducts installed outside of the thermal envelope shall be insulated to a minimum of R-8.

COMMISSIONING

- The ventilation rate shall be measured using a flow hood, flow grid, or anemometer, in accordance with the test procedures listed in ANSI/RESNET/ICC 380-2016, to ensure that the fan meets the minimum ventilation rate specified above.
- All operation and maintenance procedures shall be reviewed with the homeowner (e.g., how and when to clean the intake screen).

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.