

## 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.

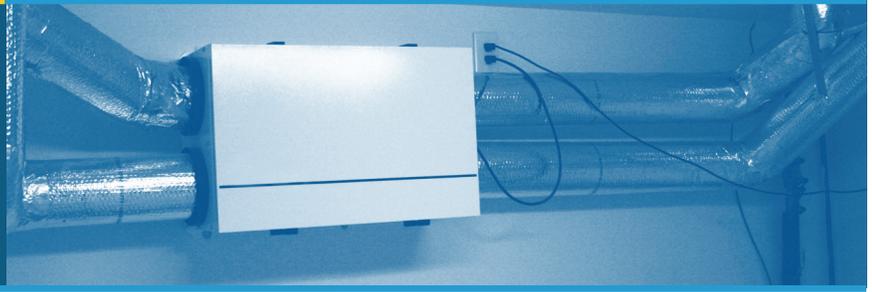
## READY TO DO MORE?

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](http://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](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

Installed correctly, a whole-house fresh air system with heat recovery can help ensure a healthier and more comfortable indoor environment with optimum efficiency.

Contaminants in homes can trigger asthma and allergy attacks as well as other health problems. Whole-house fresh air systems dilute, exhaust, and filter these contaminants. Balanced ventilation systems like heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs) bring in fresh outside air and distribute it throughout the home using either their own dedicated ducts or the home's central heating and cooling system ducts. While bringing in this fresh air, the ERV/HRV exhausts an equal amount of stale air from the home, ensuring balanced pressures throughout the home. The incoming and outgoing air pass through a heat exchanger where heat is transferred from the warmer air stream to the cooler air stream, thus heating incoming air in the winter and cooling incoming air in the summer. An ERV also transfers moisture.

## 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;
- bathroom and kitchen exhaust fans that remove contaminants, moisture, and odors;
- integration of high-capture filters in the heating and cooling system return duct to more effectively remove particulates from the air you breathe.

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

- 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 ft<sup>2</sup>, 70 cfm for 1,501 to 2,500 ft<sup>2</sup>, and 100 cfm over 2,500 ft<sup>2</sup>. 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).
- Appropriate ventilation equipment shall be selected based on the target ventilation rate and the climate.

### INSTALLATION

- The ERV/HRV shall either be connected to the central air handler and use the HVAC ducts for supply air, or have its own independent supply ducts. Return air intakes can either be individually ducted from several rooms or ducted from one or more central locations, or the ERV/HRV can use the HVAC system returns. It is recommended that each occupied room with a door have at least one ducted supply, or one ducted return, or both.
- An HRV/ERV that is connected to the central system supply side shall have a damper to keep air from flowing backward through the unit when the ventilator is off. Each occupied room should have one ducted supply or return or both.
- Outdoor air shall be filtered with a MERV 11 filter or higher, and the pressure drop across the filter shall match equipment capabilities. The filter shall be installed to be easily accessible by occupants.
- The fan shall be oriented so the equivalent length of the duct run is as short as possible. "Equivalent length" shall be calculated in accordance with ANSI/ACCA Manual D Residential Duct Systems.
- The exhaust duct outlet vent shall be located on the exterior of the home where it does not direct air flow onto a walkway and it is situated at least 10 feet from any air inlet.
- Outdoor air intakes shall be equipped with screens to keep out insects and debris, integrated with siding including flashing required to prevent water intrusion, and sealed with caulk or spray foam where the edges of the duct meet the exterior walls or ceilings to limit the infiltration of exterior air into the home.
- 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 test procedures listed in ANSI/RESNET/ICC 380-2016, to ensure that the fan is providing the minimum ventilation rate specified above.
- All operation and maintenance procedures shall be reviewed with the homeowner (e.g., how and when to change filter).
- 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: \_\_\_\_\_

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