U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

PORTLAND CLEAN ENERGY COMMUNITY BENEFITS FUND

Home Improvement Expert™ Factsheet

Bathroom Exhaust Fan

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 bathroom exhaust fan can be used to remove moisture and odors and also run continuously as a whole-house fresh air system for a healthier indoor environment.

Washing and bathing release significant amounts of water vapor into the air. For instance, a shower produces a half pint of water vapor for every 5 minutes of run time. With no exhaust fan, this moisture can accumulate and increase the risk of mold and mildew on floors, walls, and ceilings. High-efficiency exhaust fans can quietly exhaust bathroom air to the outside. These bathroom exhaust fans can be operated manually or automatically with humidity sensors. In addition, they can be operated continuously as a whole-house fresh air system to exhaust stale air. The fan should be ducted to exhaust outside not into the attic. Make-up air can come through leaks in the home's walls, floors, and ceilings or through intentional fresh air intake ducts.

RELATED HOME IMPROVEMENT CONSIDERATIONS

When installing a new bathroom exhaust fan, consider working with a qualified home energy assessor to evaluate other related home performance needs and opportunities. This includes:

- kitchen exhaust fans that remove contaminants from cooking directly to outdoors; and
- integration of high-capture filters in the heating and cooling system return duct to more effectively remove particulates from the air you breathe;
- evaluation of radon levels, which may be impacted by negative pressure resulting from the addition of bathroom exhaust fans.

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.

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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.

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For more resources, visit
basc.pnnl.gov/home-improvement-expert

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Home Improvement Expert™ Checklist
Bathroom Exhaust Fan

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

☐	Bathroom exhaust fans used only for spot exhaust shall have a mechanical exhaust capacity of at least 20 cfm for continuous operation, or at least 50 cfm for intermittent operation. To ensure these minimum flow rates are met, it is recommended that the bathroom exhaust fan selected has a rating of 50 cfm for continuous operation, or 70 cfm for intermittent operation.
☐	Bathroom exhaust fans used for continuous whole-house ventilation shall have a mechanical exhaust capacity based on house size as follows: 50 cfm for up to 1,500 ft2, 70 cfm for 1,501 to 2,500 ft^2, and 100 cfm over 2,500 ft^2. If the fan is to be used to meet MVL a blower door test should be performed
☐	The bathroom exhaust fan shall be ENERGY STAR certified.
☐	If connecting the new fan to an existing exhaust duct, the existing duct shall be checked to ensure it is made of rigid metal (e.g., galvanized steel, stainless steel, or copper), has a smooth interior surface, is equipped with a functioning back-draft damper, meets the maximum length guidelines specified in the IRC (2015 IRC Table M1506.2), and meets the minimum diameter or dimension guidelines specified in the fan manufacturer's installation instructions. If not, the homeowner shall be advised to replace the exhaust duct.

INSTALLATION

☐	The bathroom exhaust fan shall be installed to vent outdoors, not into an attic, crawlspace, or space between floors.
☐	The exhaust duct shall be installed with the most direct route to the outside, with as few bends as possible, and with no bends for the first three feet of duct from the fan.
☐	The exhaust duct outlet vent shall be located on the exterior of the home at least 10 feet from any air inlet and where it does not direct air flow onto a walkway.
☐	All exhaust duct seams and connections shall be sealed with mastic or UL 181 tape.
☐	All ceiling and wall or roof penetrations shall be sealed with mastic, caulk, or spray foam at interior surfaces and flashed at exterior surfaces.
☐	In a vented attic, the exhaust fan should be air sealed to the ceiling drywall with caulk, spray foam, or tape. The exhaust fan should be covered with attic insulation.
☐	The wall cap shall include a damper that closes when the fan is not exhausting.

COMMISSIONING

☐	The wall cap damper shall be checked to ensure it is operating correctly.
☐	The exhaust fan flow 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 and adjustments shall be made to ensure the fan is providing the minimum flow rates specified above.
☐	The fan should be set to operate as desired by the homeowner (e.g., spot or continuous ventilation) and maintenance procedures shall be reviewed with the homeowner (e.g., check vent annually and clear debris and insect nests).
☐	It is recommended that a radon test kit shall be acquired by the homeowner with a recommendation to remediate if post-retrofit radon is above EPA limits.

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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