

Effective Bathroom Ventilation

By Dave Newton

Plumbing codes require bathrooms to contain an operable window, an exhaust fan, or both — for good reason. In an unventilated bathroom, warm, moisture-laden air can condense on cool wall and window surfaces, where it supports bacteria and mildew growth, causes paint failure, and may even lead to structural damage from decay, as it penetrates and condenses in wall cavities.

The problem with the minimum code requirement is that no one wants to leave the bathroom window open year-round, and most exhaust fans are too noisy. Do your customer a favor by recommending a bathroom ventilation strategy that works: a quiet fan with enough exhaust capacity for the space, and controls that make it convenient to use.

Effective Air Change

The Home Ventilating Institute (847/394-0150) recommends that each bathroom have a mechanical ventilation unit with sufficient capacity for a minimum of 8 air changes per hour. To determine the proper rate of air exchange for a specific bathroom, calculate the cubic-foot volume of the room, using the following formula: width x length x height = cubic feet (cf); cf x 8 (exchanges per hour) = cfh; cfh ÷ 60 minutes = cfm. For example, a 7x12-foot bathroom with an 8-foot ceiling has a volume of 672 cf. At 8 air changes per hour, the rate is 5,376 cfh (8 x 672) or 89.6 cfm (672 cfh ÷ 60 minutes). Therefore, the fan for this room should have a minimum capacity of 90 cfm (see Figure 1).

Controls

The fan should be controlled by a timer, not a standard on-off switch. A timer allows the fan to run after a shower is completed, removing moisture

Sizing a Bathroom Fan

1. Calculate room volume:

$$7'-0" \times 12'-0" \times 8'-0" = 672 \text{ cu. ft.}$$

2. Figure out the required air exchange per hour.
The recommended rate is 8 air changes per hour:

$$8 \text{ air changes/hr.} \times 672 \text{ cu. ft.} = 5376 \text{ cu. ft./hr. (cfh)}$$

3. Divide air changes per hour by 60 (minutes per hour) to get the cfm rating of the fan:

$$5376 \text{ cfh} \div 60 = \text{cfm rating of } 89.6$$

4. For this bathroom, use at least a 90 cfm fan.

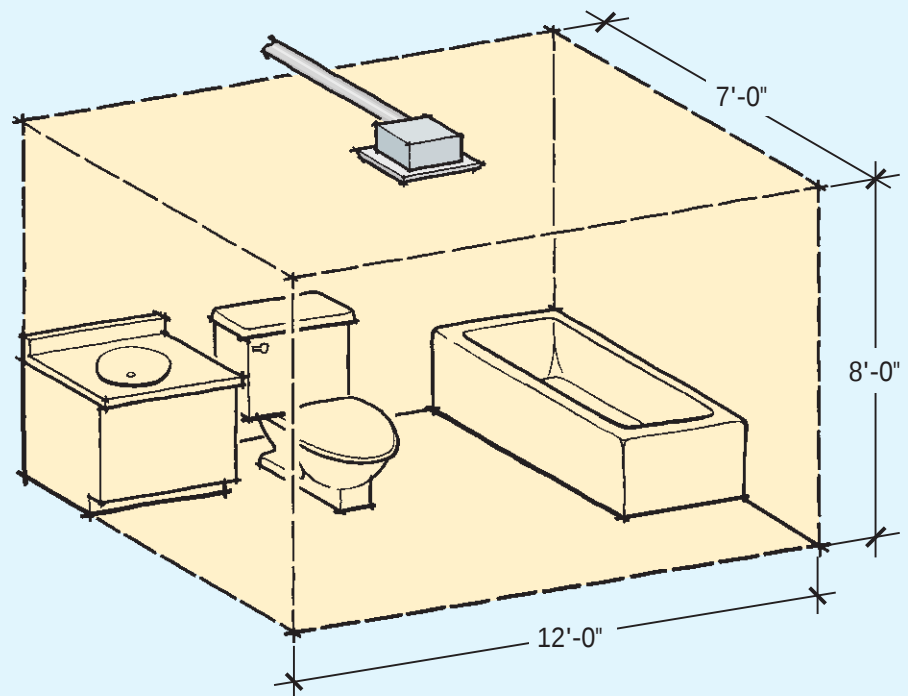
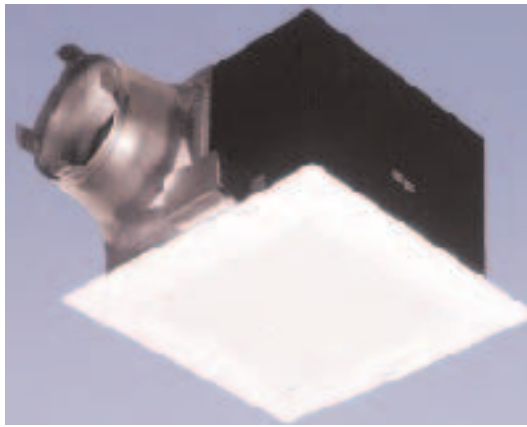


Figure 2. Automatically control bathroom air exchanges using a humidistat sensor, which detects rapid rises in humidity, and turns on the ventilating fan. Tamarack's Humitrak (below) and Broan's Model DH100W (below right) are wall-mounted, with variable settings for relative humidity and runtimes. Built-in sensors in Broan's SensAire Series (right) detect humidity and motion, to automatically control lighting and ventilation when you enter the room. All units feature a manual switching option for odor removal.



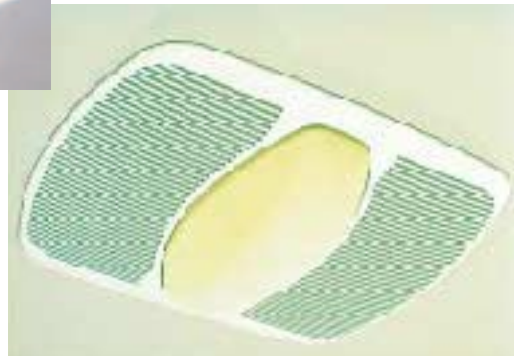
from the room *and* the ductwork. Humidistat controls are another good option, since they will automatically turn the fan on when the humidity in the room rises above a predetermined setting, switching off again when the equilibrium air moisture content is restored. These controls are available as wall-mounted units, or built in, as with Broan's SensAire series of ventilating fans. Manual ventilation for odor control can usually be activated with an override switch (Figure 2).

Get Rid of the Noise

Pay attention to the noise level of the ventilation unit. A cheap fan is noisy, and moves very little air, so it's not likely to see much use. Low-sones high-volume units are available from several manufacturers. These fans combine high rates of air exchange with quiet performance (one sone is about equal to the sound of a running refrigerator). A good ventilator will typically run at a quiet 1.5 sonas, while providing a 110 cfm air exchange. Many choices are available for ventilation units with ratings of 2 sonas or less.



Figure 3. Address noisy, ineffective bathroom ventilation with a high-volume low-sones unit, such as Panasonic's Whisper series (left), or an AirKing unit (below). These are available in a range of cfm capacities, some with lamp options.



Panasonic's "Whisper" series of ventilating fans is available in ratings from 31 to 340 cfm, operating at noise levels from 0.5 to 3 sones (Figure 3). For the most effective removal of humid air, locate the intake above the tub or shower. If this isn't possible, center it in the bathroom ceiling. In large bathrooms, where fixtures are farther apart, two intakes may be needed for adequate coverage.

Another option is to install a high-capacity ventilation unit, such as Broan's remote in-line ventilator. Located in an attic or other remote location, a central ventilating unit can handle either multiple locations in a large bathroom or separate rooms, and produces virtually no sound at the intake location.

Duct Basics

Ventilation requires ductwork, and here there are some important installation cautions to observe. Short, straight, smooth-walled round ducts are the most efficient: Remember that every 90-degree elbow in a duct run reduces air flow by 25%, or the equivalent of a 10-foot straight run of pipe. Avoid flexible duct, because the ridges generate a lot of resistance to air movement. Where elbows or extra long ducts can't be avoided, a more powerful fan will boost ventilation, although that will also lead to increased noise.

Plan duct runs carefully, and avoid

long, complicated pathways. If long runs and turns are required, use broad sweeps instead of abrupt turns. The best configuration is always short and straight. Finally, to avoid potential drips from condensation within the duct, keep duct seams on top and pitch horizontal runs slightly toward the outside to drain.



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Source of Supply

AirKing

West Chester, Pa.
800/394-3267

Broan-Nutone

Hartford, Wis.
800/548-0790
www.broan.com

Panasonic

Cyprus, Calif.
714/373-7205
www.panasonic.com

Tamarack Technologies

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800/222-5932
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