by Henri de Marne

BATHROOM VENTING *that works*

Keep the ductwork warm and pitched toward the exterior.

Bathroom ventilation in one form or another is not only desirable, it is also required by building codes. Although its main purposes are to provide a healthful exchange of air and remove odors, ventilation also helps in controlling excessive humidity.

Thus, in a residential bathroom with no window that opens to the outside, you need a ducted electric fan to meet code requirements.

The problem here is that a fan will only remove stale air and moisture when it is turned on, and a window will only do the job when it is opened. Both are at the mercy of the occupants.

Of course, moisture removal from a bathroom can be accomplished simply by leaving the bathroom door open.

My personal preference in cold climates is not to install a fan in an inside bathroom, although I've had to do it to meet the code approval. And, I certainly would not install a fan at all in a bathroom with a window unless pressured into it by clients whom I couldn't convince otherwise.

I am reluctant to use fans because I know that they are seldom used (except where wired directly to the light switch, a practice that is wasteful and annoying), and pose round-the-clock problems during the heating season.

Even in moderate climates, bathroom fans may be responsible for stained ceilings, condensation dripping on the bathroom floors, and rusting of their own metal parts. Cold air drafts can often be felt by wet bathers and large amounts of warm air can escape *to* the outside.

Poor Venting Practices

Most of these problems are due to the way that builders and electricians install these fans. Some follow one or another of the accepted standards for venting bath fans to the exterior, which don't work very well; while others vent directly into the attic—a definite no-no.

Exterior venting takes the form of venting through the roof, the soffits, or the walls. Venting through the roof creates one more perforation that can lead to eventual leakage. In snow country, it may be covered by snow for the duration of winter, and warm moist air, either propelled through the duct by the fan or just convected by natural forces, can condense on the duct's walls and run back inside—causing dripping, staining, and rusting.

Venting into a soffit, or through the wall just below a soffit, also has problems. If the overhang is not vented, mildew and staining will certainly develop on the soffit and wall. If the overhang is vented, in addition to potential mildew and staining of the soffits, the discharged air from the bath fan will be sucked into the attic by the normal movement of ventilation air. Thus the moisture almost entirely ends up in the attic where it's not wanted.

Venting through a gable wall is best but this does not necessarily solve all problems. (This approach will be discussed later.)

An unacceptable practice, too often found, consists of not attaching a duct to the fan housing and letting the fan discharge directly into the attic. This commonly wets the ceiling in the immediate discharge area, and eventually disintegrates the ceiling finish. The situation is aggravated when the insulation is brought tight against the outlet, sometimes even covering the fan. A soggy mess develops, particularly when the insulation happens to be cellulose.

Installing a short length of duct to reach above the insulation is no improvement.

In both these cases, moisture is simply discharged into the attic adding to whatever moisture is already convected and diffused from the living area below. In the case of a small attic above splayed ceilings, or a low ranch-type roof, even with gable vents, the result generally is condensation on the sheathing and rafters. Severe mold, delamination of plywood, and rot of sheathing boards and rafters are not far behind.

In many cases the duct is vented to the exterior, but the configuration of the duct leaves much to be desired. Bends are often necessary but should be avoided as much as possible. On several occasions, I have found roof venting where the flexible duct actually had a trap built in because the installer wired it up onto a truss web but did not cut it to length from there to the roof vent. Not only did the trap contain water, but each bend greatly reduced the effectiveness of the fan.

The same is true when the horizontal duct is allowed to snake over the insulation or drape over each joist on its way to the outside outlet. I have seen some ducts so completely folded over that no air could get through.

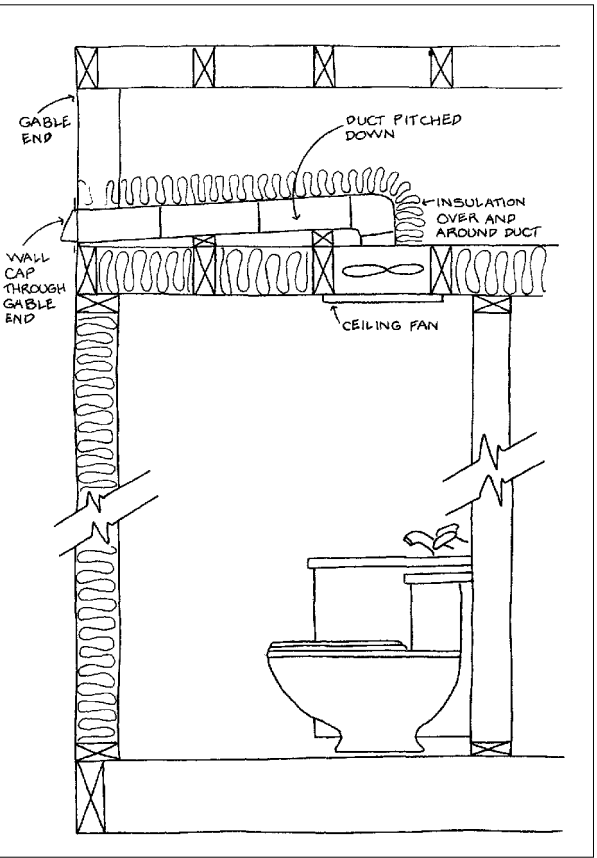
These problems are rather simple to remedy. Primarily they require common sense, a little knowledge, and a commitment to do things right.

Exterior ducting through gable walls can be greatly improved in cold climates by insulating the duct to delay the formation of condensation. This is best done by splitting an R-11 unfaced fiberglass batt lengthwise and laying a strip tightly on each side of the duct. Then lay an uncut piece on top of the duct and the two side pieces.

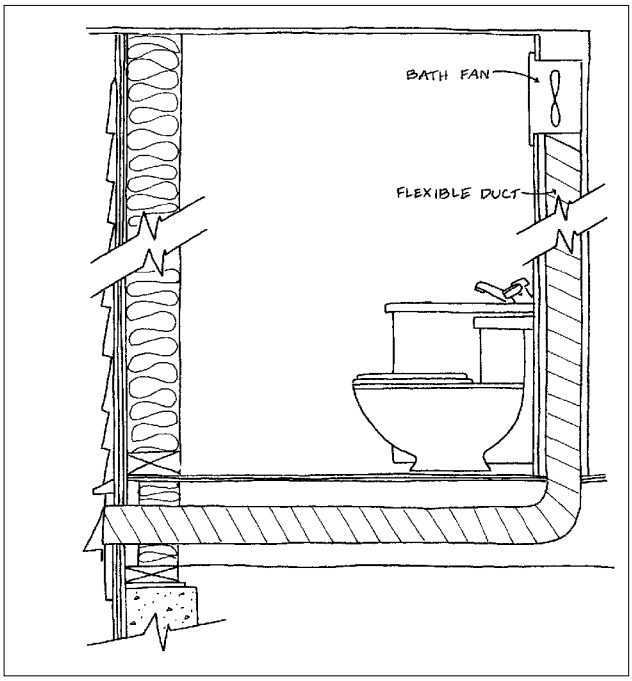
A worthwhile improvement in cold climates is to connect the fan housing with flexible ducting to a rigid Schedule-10 plastic bell pipe pitched downward to the wall jack. This is simply done by setting the plastic pipe on blocks of diminishing depth nailed to the tops of the floor joists. Any condensation that forms in the plastic pipe will flow to the outside.

Try to install the wall jack on the south side so that any icing will have a chance to melt on sunny days, and try to shield it from the winter's north winds. Use a quality wall jack with a spring-action flap. With the jack on the south, the pipe pitched downward to the outside, and insulation tightly snugged all around the duct, condensation problems and cold drafts are minimized.

A bath exhaust that vents or leaks into the attic can cause frosty sheathing. When the frost melts, you can get moldy wood or wet ceilings.



In retrofits: *Run the fan up to a pvc pipe in the attic. Pitch the attic pipe downward to a wall cap in the gable end. Insulation over and around the attic duct should minimize condensation, and any that occurs should safely drain away.*



The preferred method: *Run the ducting down to the basement and out the band joist. Cold air will not leak in. Also, any condensation that occurs will not damage finish materials.*

However, this does not solve the exfiltration problems, particularly in second-floor bathrooms where the false chimney effect is at its strongest.

But there is a way to have your cake and eat it too. A bathroom venting system I devised about ten years ago and have used ever since in new construction, and wherever possible in remodeling and restoration, solves problems with condensation, cold drafts, heat loss, rusting, and dripping.

Working with Physics

If we want to use the laws of physics to our own advantage instead of having them work against us, bathrooms should vent down instead of up.

Install the fan in the plumbing wall instead of the ceiling, thus avoiding the insulation problems the fan causes. Point the fan outlet downward and attach flexible ducting to it firmly by clamp and duct tape.

Route the duct by the most direct path to the crawl space or basement, then to the outside through the band joist.

Think of it. The warm moist air is pushed down and what is not exhausted is stored in conditioned space instead of in a cold attic. Its heat is recaptured and little condensation occurs.

Since the jack is at the lowest possible position instead of being subjected to exfiltration forces, it now is in the infiltration zone of the house. The stack effect now has a tendency to shut it tighter, instead of pushing the flap out.

Any condensation will occur near the outside jack, and, if dripping occurs, it does so in the basement or crawl space where it is less likely to cause problems than in an insulated ceiling. (Editor's note: This bathroom venting system won both a state and federal energy award in 1985 as part of a statewide and nationwide competition sponsored by the U.S. Department of Energy.)

This venting system is easily installed in new houses or condominiums in first and second-floor bathrooms. Where two bathrooms vent to the outside, you can install a T-Y in the basement in order to eliminate the need for the second wall jack.

In retrofit, remodeling, restoration, or rehab, there are often ways to work in this ducting system. For example, take the case of the addition of a bathroom on the first floor of a house. The fan does not need to be installed near the ceiling. It can be installed anywhere in the wall thus permitting easier ducting down.

In the case of a second-floor bathroom, the duct may be run through a closet on the first floor, and so on. With a little ingenuity, you can usually find a way.

Your only other decisions are the choice of fan and how you will control it.

Choosing the Fan

Even though quiet fans are more expensive, you should use them—the difference in noise level is considerable and quiet fans are more likely to be used. Your supplier's catalog will typically rate the fans in sones. Look for a rating of 3 sones or less.

Bathroom fans are frequently controlled by connecting them to the light switch. Not only is this annoying, since most of the time the fan is not needed, but it also wastes energy and can disturb sleep if the bathroom is used during the night.

A separate switch is far preferable but unreliable. It may not be used when needed or it may be forgotten, causing the fan to run for hours.

By far the best fan control, in my opinion, is a 15-minute timer. When it's needed it can be turned on for whatever length of time the user chooses and then forgotten.

Compare the benefits of down-venting bathroom fans with the problems caused by standard venting, and you too may decide that it's the way to go. ■

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