

Fresh Air - No Drafts

by Jon Eakes

In the old days, none of us had to worry about ventilation.

Radiator heating was fine all by itself in our drafty old houses, which got plenty of fresh air from the wind that blew in around the windows and through the walls.

When the new air-tight homes first showed up on the Canadian prairies, almost all of them had "forced-air furnaces—so cutting off the wind from blowing through the house didn't cause many problems. The furnace fan kept the air moving.

But when we built energy-efficient houses with electric baseboard heating, here's what we did:

First we eliminated the chimney, which previously had served as a 24-hour-a-day exhaust fan to draw bad air out of the house. Next we got rid of the furnace ductwork so that nothing could move the air from room to room. Then we sealed up the walls and windows. We might have installed exhaust fans in the kitchen and bathroom, but if we did they probably were so cheap and noisy that no one bothered to use them.

The result: a stuffy, uncomfortable house with problems ranging from extreme condensation on the windows to serious problems with indoor-air quality.

These problems had nothing to do with the heating system. We simply failed to solve the two basic ventilation problems that we now know must be solved when constructing or retrofitting energy-efficient houses:

1. We must get stale air out of the house and fresh air into the house without causing uncomfortable drafts.

2. We must get the air to constantly move around from room to room without leaving any dead-air pockets.

Radiator heating and even electric-baseboard heating can work very well in today's energy-efficient houses if we take care to address these two issues.

Two Options

The fancy solution might be to install a complete ventilation system that incorporates heat recuperation and provides input and exhaust in every room—a fantastic system if you can afford it and if it's cost-effective in your region.

But there are easier ways out. In our climate, there are two basic choices, each of which solves both problems cited above:

1. An exhaust-only system that draws fresh air in through the walls and intentional inlet ducts, or

2. A balanced dual-fan system that draws as much fresh air in as it blows out, pulling little if any air through the walls while delivering fresh air where it is wanted.

To avoid cold drafts in the house, both of these systems require that the incoming fresh air is handled properly.

If the fresh air is drawn in and distributed through a conventional heating-type of ductwork, it must be heated to room temperature (typically via heat exchangers, plenum heaters, solar heaters, operating furnaces or other methods). This can be an expensive proposition, both in terms of capital and operating costs.

If we're installing a ventilation/circulation system in a house that is not heated by a forced-air furnace, however, these costs can be reduced if we simply take a fresh look at what we are trying to do. We can, in fact, introduce cool, fresh air into a house with little or no preheating and still avoid uncomfortable drafts.

Reverse the Flow

The key is to recognize that because we are introducing cold—not heat—to the house, the duct and grill configurations must follow air-conditioning rather than heating principles (yes, even in the dead of winter).

Basically, we want to bring the fresh, cool air into the house at the ceiling, where excess heat can preheat and diffuse it, then use exhaust fans near the floor to draw it down from the

ceiling.

In fact, Swedish research indicates that running ventilation air through a house counter current to thermal directions significantly increases the air-cleaning effect of ventilation, requiring fewer air changes per hour to achieve the same air-quality results. Some researchers even claim that radiator heating combined with this "reverse flow" ventilation makes for a more comfortable house than what can be achieved by a traditional forced-air furnace.

When introducing fresh air to the house, intakes should not be placed in the roof or even at the top of the house, as this will cause cold air to constantly fall into the house whether it is being drawn by exhaust fans or not.

Regardless of whether they are passive or fan-forced, fresh-air inputs should be placed low in the house and directed *inside* to the ceiling area. They should be protected from the wind and located away from any source of pollution, such as a driveway, garage or laundry exhaust.

Again, we want to bring in the cool air high up in the house and far away from the exhaust fan so it can mix with hot air on the ceiling before falling down to the living space. It will then travel out of that room, down the halls and into another room before it is allowed to exit by the exhaust fan.

In effect, we are using the rooms themselves as ventilation ducts. For this to work, therefore, interior doors must be undercut one inch to allow the air to flow when the doors are closed.

Type & Placement of Grills

In general, grills designed for air conditioning should be used with this system; heating-type grills are designed to shoot warm air directly into a living space, which would be uncomfortable with our cool air.

Grills designed for air conditioning, on the other hand, shoot cool air along the ceiling, allowing us to avoid cold drafts while mixing the incoming air with the air in the room.

Floor Grills: It's best not to go with floor grills, but if there's no other alternative, a few things should be kept in mind.

A heating-type of floor grill will give you cold feet (Fig. 1) and should not be used. A floor grill with vertical louvers placed at a side wall away from occupied space is a better bet, because it will shoot the cool air straight up to the ceiling without allowing it to spill into the room very much before mixing with the hot ceiling air (Fig. 2).

Wall Grills: If wall grills are used, be sure that they have louvers directing the incoming air *up to the ceiling* (Fig. 3) rather than down into the room (Fig. 4). Wall grills should not be placed directly over the doors, because the air will simply be pulled through the doors and down the hall toward the exhaust fan.

Ceiling Grills: If incoming air is to enter the room directly from the ceiling, the grills should have air-conditioning types of louvers that direct the air along the ceiling and allow it to mix before it is falls down into the room (Fig. 5).

Ceiling intakes also can be handled with individual ducts to such areas as the bedrooms and living rooms that do not have exhaust fans. Another option is to lower the ceiling in the hall to accommodate a large cool-air plenum that feeds off into adjacent rooms.

In summary, maintaining old hot-water systems or installing low-cost electric baseboards or radiant heating systems without assuring adequate, draft-free air circulation and ventilation may save you money in the short term, but in the long term it's a false economy.

Radiator-types of heating can work quite well in air-tight houses—but only if we ensure that air is continuously moved in and out of the house and adequately circulated inside. Drafts can be avoided without excessive preheating if air-conditioning principles are followed in the distribution of fresh air.

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Fig. 1: Floor Grill with Slanted Louvers

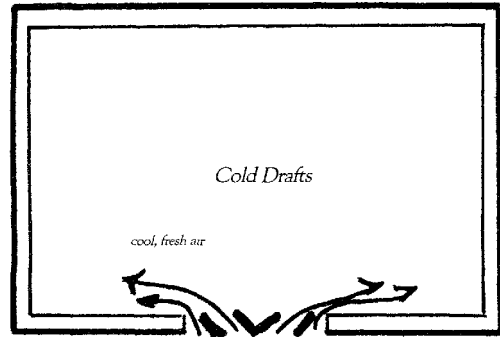


Fig. 2: Floor Grill with Vertical Louvers at Side Wall

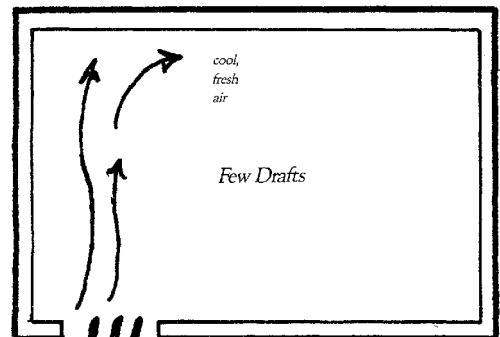


Fig. 3: High Side Wall Grill with Louvers Up

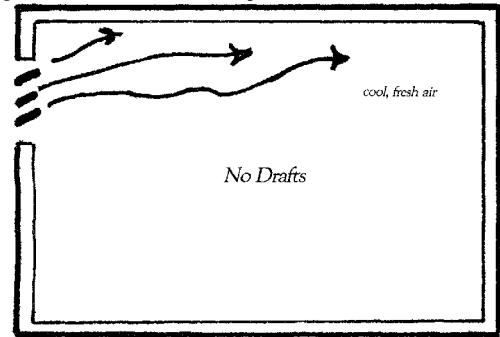


Fig. 4: High Side Wall Grill with Louvers Down

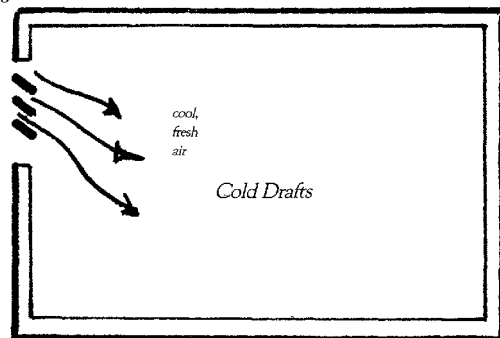
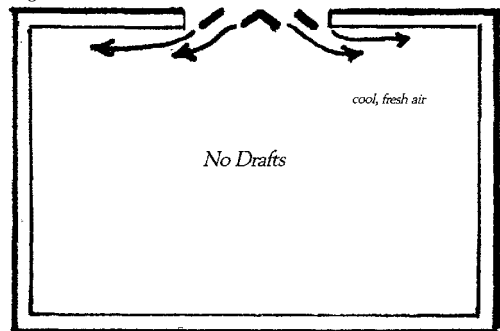


Fig. 5: Ceiling Grill with Slanted Louvers



Drawings by Janet MacLeod