Q We have had a number of customers ask for energy recovery ventilation (ERV) in their existing homes. Can we use the existing furnace ductwork? If not, what size and type of ducts can be used?

A *M. Walker of Positive Energy, an MEP engineering services firm based in Austin, Texas, responds:* The short answer is yes, you can use the ductwork for the furnace, but you may not want to. The full answer has a number of annoying and important caveats and considerations. Let's take a moment to remember the goal: Adding ventilation to a building is all about introducing fresh air for improved indoor air quality. The strategies you use to implement such a system should align with the goal of providing healthy indoor air in the building for people to breathe. If you can manage to retrofit this into an existing system for little cost, you're very lucky.

It is also crucial that the hygrothermal gradient—meaning how hot/humid it is on either side of the ERV core—be considered in your approach. An ERV will not effectively exchange enthalpy if there is not a dry/cool air mass on one side of the core media. In humid climates, this means you'll need a dedicated dehumidifier to handle latent load, especially in shoulder seasons where there isn't much dry-bulb load to deal with. Beyond the obvious implications for poor indoor air quality and material durability, I'll explain why else this is important later.

BEST OVERALL STRATEGY

The best distribution strategy for a balanced ventilation system with enthalpy (heat and moisture) recovery (such as an ERV) is an independently dedicated duct system that meets the equipment manufacturer's installation requirements. This setup allows you to leverage efficiencies of the ventilation device's designed fan performance, ensure ventilation is delivered to every room, and control locations from which your system returns. If you're trying to be careful about how much new ductwork you're adding, focus on getting fresh air supply in bedrooms and living spaces (den, kitchen, and such).

HOW BIG ARE VENTILATION DUCTS

As far as duct sizing, generally ERV/HRV collars are designed for standard 5- or 4-inch ducts. You may find it difficult to reduce the size from these diameters for several reasons (supply-house inventory, product availability for the American market, among others). You could technically reduce the standard-diameter ERV/HRV ducts down to 3 inches and run those in a wall cavity, but you have to be careful not to undersize the ductwork. There are ERV/HRV manufacturers who make flexible ductwork at this smaller scale and have some pretty slick multiport terminal devices. If you're not a mechanical engineer with calculations fresh in hand, I recommend leaning on the manufacturer for support.

WHEN NEW DUCTS WON'T WORK, USE EXISTING ONES

New ductwork is not always an option in retrofit situations, and it is possible to leverage existing ductwork as long as you're careful about how new equipment will impact the overall system performance. Positive Energy's general approach to retroactively adding an ERV/HRV into an existing system is to supply ventilation air into the air handler's return plenum (a caveat is that you'll need to move a return-air temperature sensor upstream).

Most ERVs like this one (upper piece of equipment) have ports for standard 4- or 5-inch ductwork. Note that this system includes the indoor coil (lower piece) for a dedicated dehumidifier, which will be needed in most locations to address latent loads.

Photo: Tom Dugan

Generally, ERV/HRVs aren't moving a tremendous volume of air (50 to 100 cfm is common), so adding this volume into an HVAC system's return doesn't necessarily cause fan-to-fan issues or significantly increase system pressure. However, to deliver that air to the existing diffusers, you'll need to rely on the air handler's fan, which is much larger than an ERV/HRV fan and will use more energy even when you don't need heating/cooling. There is plenty of nuance we could get into regarding operational strategies in this configuration that can greatly impact energy use, but that's beyond the scope of this article. You'll also need to figure out where you're going to get return air from for the ventilation system and ideally return from foul-smelling areas like bathrooms and the kitchen. This is where the challenges of coordinating with other trades really kick in.

Remember the dehumidifier consideration from earlier? If you need a dedicated dehumidifier (and in most places, you probably do) and are trying to leverage existing ductwork for both the humidity control and the ventilation, it is crucial to understand the pressure that will be created in the system. Adding too much pressure to a duct system will prevent it from delivering the needed airflows to the terminal devices (registers) and can cause serious comfort issues, among other performance deficiencies.

There are other potential cost-saving strategies. Leaving existing in-line bathroom fans in place may be a convenient way to repurpose existing opportunities for an ERV/HRV return where foul-smelling and high-humidity events regularly occur (that's the stuff we want to get rid of the quickest) if you can intercept that exhaust ductwork. Obviously, this is not an easy thing to do if you're up against spatial constraints with inaccessible existing ductwork. If you're clever about it, decommissioned flues may also be repurposed for ERV/HRV exhaust out of the building, but please be discerning about their condition before doing so. Again, refer to the ERV/HRV manufacturer specifications for specific details.

IT'S ABOUT HEALTH

Ventilation is a necessary function of buildings and can make a tremendous impact on health outcomes in the spaces where we spend time. Ventilation is crucial to good indoor air quality. When buildings are constructed with more airtight assemblies, we need to reliably introduce outdoor air—filtered and within a reasonable temperature and humidity range—via mechanical means, and we want to exhaust old, fouled air. Compared with the old method of random ventilation or exhaust-only, this strategy adds cost and requires architectural accommodation. It's unfortunate, but most often, it'll be costly and inconvenient to retrofit buildings with existing equipment that wasn't originally designed to meet our new goals. We can't walk into the next 50 years of construction with the same budget expectations and practices that existed in the previous half-century. As our knowledge of building performance evolves with research, especially health research, so too should our approach to every aspect of creating new living space.

Q A few years ago, I used Type 304 stainless steel trim screws to face-fasten composite decking to pressure treated framing for a new back porch. My clients reported that the screws had rusted after one season, during which deicing salts were used on the deck (we work in the upper Midwest). We replaced the fasteners with Type 316 stainless-steel screws from the same manufacturer, and the same thing happened the next season. Is this typical for stainless steel, or is something amiss with the manufacturer's version of "stainless steel"?

A *Foster Lyons, an engineer and building-science consultant, responds:* If the fasteners are truly rusty, they aren't stainless steel. If they are just stained (dark), or streaking a dark stain, that's to be expected in the presence of salt. My guess is that is what you are seeing—stain, not rust.

Here's the thing with stainless steel: It's stain *less*, not *never*-stain steel. The 304 and 316 alloys of steel are known to stain in the presence of chloride salts, whether from exposure to salty air at the beach or from salty deicers. This is a common irritation for homeowners who build on the oceanfront, who believe they are buying a material (for railings, for example, as well as for fasteners) that will never stain and then are surprised when it becomes blotchy and stained after the first storm.

While 317LMN or 904L alloys won't stain as much, I doubt that you'll have much luck finding a fastener manufacturer that makes screws using these higher-priced alloys. A better option is to educate your clients about the difference between stain and rust and suggest the use of a chloride-free ice melt. You could also recommend replacing the face-mounted screws—which create a small recess that allows salty snow melt to puddle around the fastener heads—with plugged screws. The fastener heads might still stain, but they won't corrode, and they won't be visible underneath the plugs.