



## INDOOR AIR QUALITY Breathing Easy in a Unity Home

### A Whole-house Approach

We rarely hear anyone these days arguing for drafty construction because “buildings have to breathe.” Building scientists have known for decades that “build tight and ventilate right” is the appropriate mantra for creating homes that are healthy, comfortable, energy efficient and durable. Buildings cannot be too tight, but they can have inadequate ventilation. By taking a whole-house approach to material selection, air sealing and ventilation, Unity ensures that every home we build has healthy indoor air quality.

### Healthy Indoor Air Starts with Non-toxic Materials



At Unity, we choose carefully when it comes to the ingredients that go into your home. Our sustainability specialists evaluate all the materials we use to ensure that they meet green building standards for both health, safety and sustainability. We use only low- or no-VOC (volatile organic compound) materials and finishes, so that they do not contribute to indoor air pollution. Natural wood-based materials, cellulose insulation and finishes derived from milk whey make the cut.

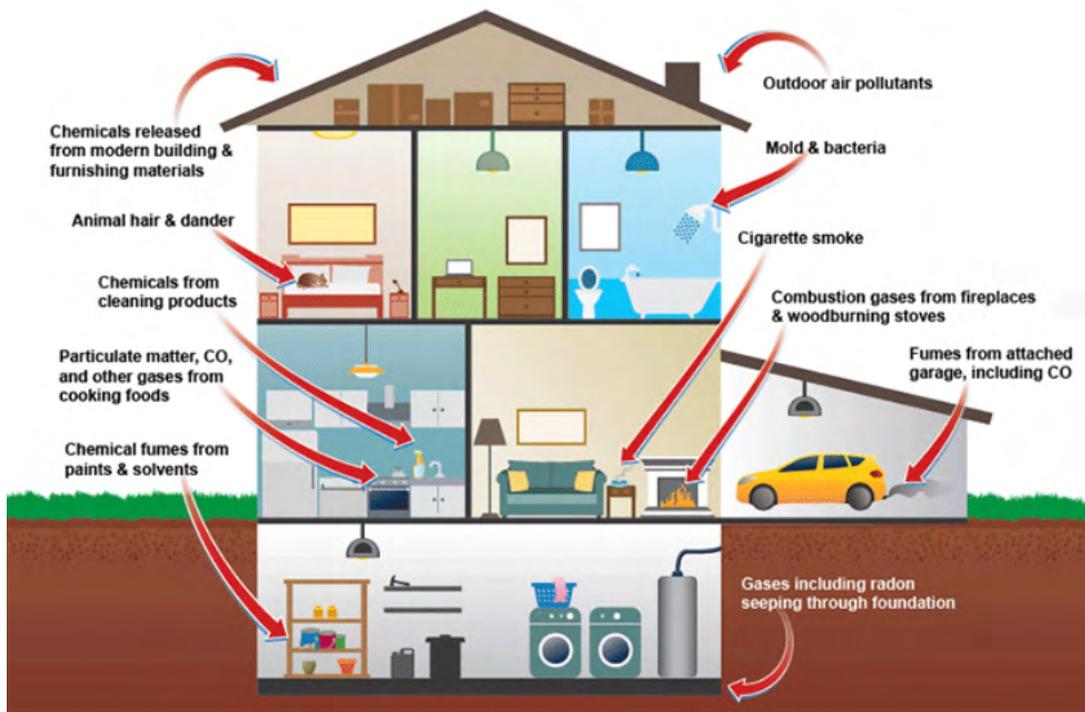
We also take care to protect materials during construction.

Because the lumber and sheet goods used to build our panels are stored in the controlled conditions of our shop, we minimize the potential for moisture damage and mold.

### Why “Build Tight”?

Another way to phrase this question is “why not build a leaky house?” In homes that are not well air-sealed, warm air within the house rises due to the stack effect, and escapes through cracks and gaps. This creates negative pressure in the house that draws air in through holes and crevices down low in the house. The negative pressure is increased when bath fans, range hoods and venting dryers are in use. The make-up air coming into the house is not controlled or filtered. It’s bringing moisture, dirt, allergens and other contaminants into the house as it passes through the walls and foundation. And it needs to be heated—a waste of energy—to replace the warm air that’s being lost through the roof.

There is a better way, which is to build tight, and provide appropriately controlled heat recovery ventilation—or, as we like to call it, a “fresh air system.”



*Sources of indoor air pollution*

## Tapes and Gaskets for a Healthy Home

Building tight is simple in principle, but it can be challenging to do well, particularly for homes that are built piece-by-piece on a jobsite. At Unity, we complete much of the air sealing for our homes in the controlled conditions of our shop, where well-trained team members use high performance tapes and gaskets to air seal panels, and around windows and doors.



*Air sealing a window rough opening*

We are also able to prefabricate into our panels any through-penetrations for ducts, pipes or wires, which greatly simplifies the final air sealing on site.

## Blower Door Test

After our crew raises the shell of the home on site, we typically conduct a blower door test to measure and reduce the amount of air leakage between inside and out.

The blower door, often in conjunction with an infrared camera, helps us to find and seal any remaining leaks in the building shell.

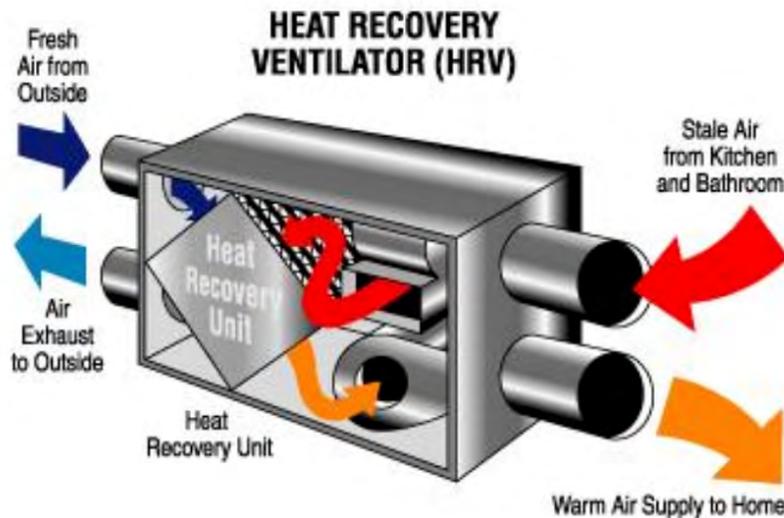
For those who care (and we do!), our goal with the sealing is to reach a level of airtightness better than one air change per hour (ACH) at 50 Pascals depressurization. It's not unusual for us to reach Passive House airtightness levels (0.6 ACH50) with our shells.



*Blower door set-up*

## Balanced Ventilation

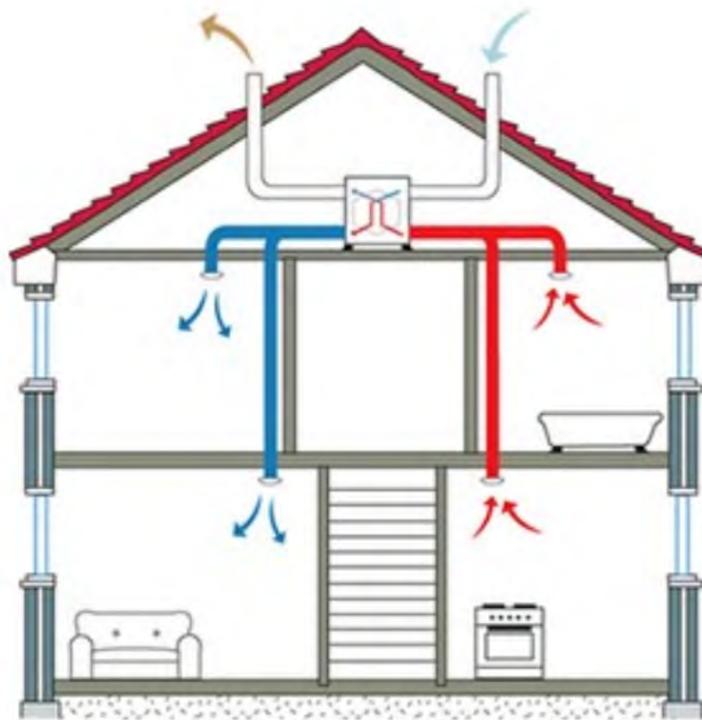
How does fresh air get into a house when it's built as tightly as ours? We specify mechanical ventilation systems designed to provide continuous balanced ventilation to the home.



Unlike a simple bath fan, which creates a negative pressure by exhausting air from the house, our ventilation systems maintain balanced pressure by bringing in fresh air equal to the amount of stale, moist air being exhausted. The beauty of these systems is that they recover heat from the air going out, and transfer it to the air coming in—hence the term “heat recovery ventilation,” or HRV. The air coming into the home is fresh, tempered and filtered—in a word, healthy.

## System Components

A heat recovery ventilation system consists of the appliance itself (in a rectangular metal box), plus a network of ducts for air distribution. The HRV box holds filters and the heat exchanger core. Two ducts on one side of the HRV connect it to the outside. One brings fresh air in, and the other exhausts stale air out. Multiple ducts on the other side of the appliance bring the tempered air to bedrooms and living areas, and exhaust air from bathrooms and the kitchen. As the incoming air passes through the heat exchanger core of the HRV, it picks up roughly 85% of the heat from the warm air that is being exhausted out.



*Supplying fresh air/exhausting stale air*

Depending on the location of the home, we sometimes specify Energy Recovery Ventilators, or ERVs, rather than HRVs. ERVs are similar to HRVs, but instead of transferring just heat from outgoing to incoming air, they also transfer a portion of the humidity in the air, and the enthalpic energy that the moisture contains.

## HRV Installation

Since every Unity Home requires heat recovery ventilation, we ensure early in the design process that the plan includes space for the HRV and a strategy for running the ducts.

The HRV boxes themselves are typically hung from the ceiling of a mechanical closet or basement, or mounted in a conditioned attic. The location should facilitate the minimal maintenance required by an HRV, typically just cleaning the air filter several times per year.



*Typical HRV installed in a Unity Home*

The two ducts that run from the HRV to outside typically terminate at duct hoods separated by a distance of ten feet.

The network of ducts supplying and exhausting air from rooms in the house is generally more extensive. Air is pulled from bathrooms and the kitchen through the exhaust ducts, and it's supplied to the bedrooms and living areas through supply ducts.

Unity commissions its HRV systems prior to occupancy, to ensure that the proper amount of air is being exhausted from and delivered to the rooms being ventilated.

## Operation and Maintenance

HRVs are quiet, unobtrusive appliances. The only indication seen in the finished spaces of the home are the grills of ducts that are either exhausting air or supplying it.

A wall-mounted switch controls the run time and speed of the HRV. They are most commonly programmed to run continuously, or for a set number of minutes every hour, so that fresh air is provided to the home 24/7. Bathrooms usually contain a boost switch that increases the pull of the fan for a fixed length of time, to exhaust excess moisture from showers.

Maintaining an HRV is straightforward. Typically the filter, which is easily accessible behind a hinged panel, should be cleaned every 3 to 6 months, and the exterior vent hoods should be checked periodically to confirm that they are not obstructed.

Heat recovery ventilation systems have been used for decades to ensure that high performance homes have a continuous supply of healthy fresh air. Given the benefits they provide to homeowners, we believe that these systems should be installed in every new home built.

## Additional Information

Article from Passive House Academy of New Zealand: [Airtightness - too much of a good thing?](#)

EPA's [Care for Your Air](#) document

Green Building Advisor: [Six Steps to Success With Heat Recovery Ventilation](#)

[Lifebreath Residential HRVs](#)