ZA 101.05
Air Distribution Overview

20 minutes

Estimated duration to complete this Learning Segment

Zehnder Academy Learning Path

This segment is part of the training for:

Zehnder America Certified Comfosystems **SPECIFIER**

Zehnder America Certified Comfosystems **INSTALLER**

Zehnder America Authorized Comfosystems **TECHNICIAN**

Zehnder America Authorized Comfosystems **DEALER**

Zehnder America Authorized Comfosystems **DISTRIBUTOR**

Knowledge Level:

Introductory

Recommended prerequisites:

- ZA101.01 IAQ Basics
- ZA101.02 Basic Principles of Ventilation
- ZA101.03 Introduction to Ventilation Standards
- ZA101.04 Introduction to Energy Recovery Ventilation

LEARNING OBJECTIVE(S)

By the end of this course, participants will be able to...

1. Contrast the function of ventilation with heating/cooling systems
2. Review the pros/cons of ducting an HERV system into a heating/cooling system
3. Advocate for stand-alone ventilation systems

Learning Objective 1

Contrast the function of ventilation with heating/cooling systems

Introduction

In this Learning Segment we'll begin talking about the application of whole-house ventilation systems. How do they get installed in a house? How do they relate to the heating and cooling systems?

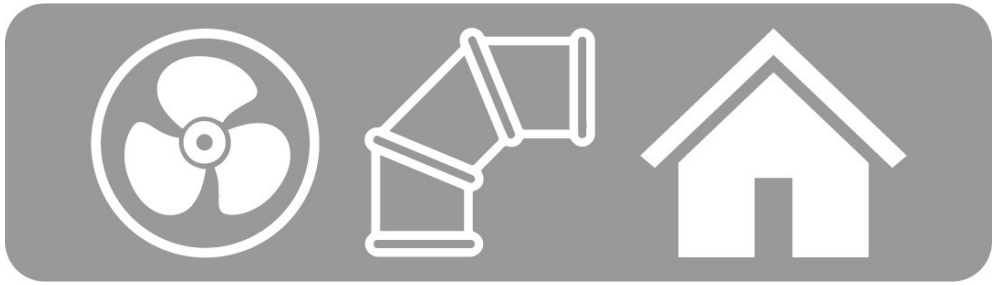
Currently it's common in North America to integrate ventilation systems with heating and cooling systems. This is probably because both types of equipment are usually installed by the same crews and appear to have similar functions. But let's take a closer look and challenge that assumption...

Common Features

What do whole-house ventilation systems have in common with forced-air heating and cooling systems? Really just a few things…

- They have fans or blowers.
- They have ducts.
- They move air around the building.

To some people that might be enough to lump ventilation and heating/cooling into the same category. But they have more that distinguishes them than they have in common…



Distinguishing Features

Here's a partial list of what separates whole-house ventilation systems from forced-air heating and cooling systems…

- The function of the air being delivered.
- The volume of air required for the function.
- The ideal duct size to deliver that air.
- The best means of controlling the system.
- When the system should run.
- Which rooms should have supply.
- Which rooms should have return.
- Whether air should be recirculated.
- The extent to which the air is polluted.

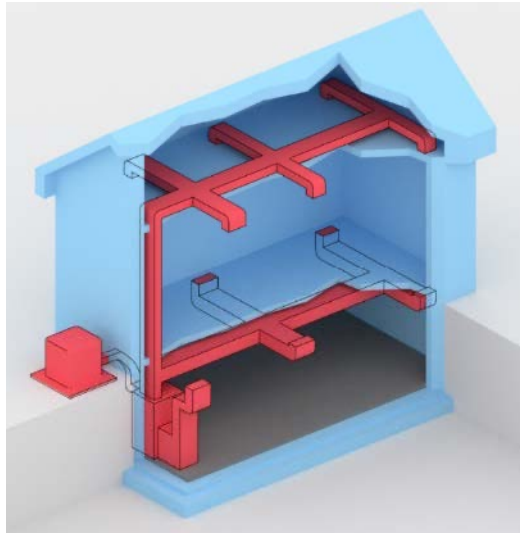
Distinguishing Features

Take a moment to review the following table and contrast the features of Heating/Cooling vs. Ventilation.

	Forced Air Heating/Cooling	Whole-House Ventilation
Function	Maintain constant temperature	Maintain good air quality
Required Flow Rate	Typically 1,000+ cfm	Typically 100+ cfm
Ideal Duct Size	Large	Small
Controls	Temperature based	Occupancy based
Run Time	Intermittent as needed	Continuous during occupancy
Supply Rooms	All	Bedrooms, living rooms
Return Rooms	All	Bathrooms, kitchens
Recirculation of Air	Always	Almost never

Distinguishing Features

The separate purposes of heating/cooling and ventilation systems drive a lot of their functional and physical differences.



In short, they ideally want different sized ducts to carry different amounts of air with different qualities to different parts of the house at different times of day.

Knowledge Check

Learning Objective 1

Contrast the function of ventilation with heating/cooling systems

Whole-house ventilation systems and forced air heating and cooling systems are...

A. The exact same thing
B. Are commonly used together in North America
C. Have different functions and duct sizes
D. Both B and C

Knowledge Check

Learning Objective 1

Contrast the function of ventilation with heating/cooling systems

Whole-house ventilation systems and forced air heating and cooling systems are...

A. The exact same thing

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C. Have different functions and duct sizes

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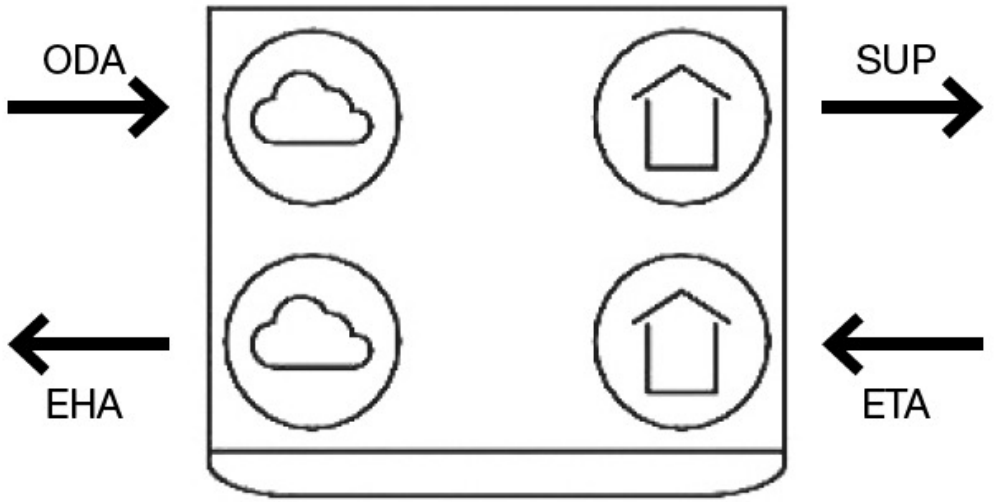
Learning Objective 2

Review the pros/cons of ducting an HERV system into a heating/cooling system

HERV Duct Connections

Despite the differences in function, it is common in North America to see HERV systems combined with the heating/cooling system.

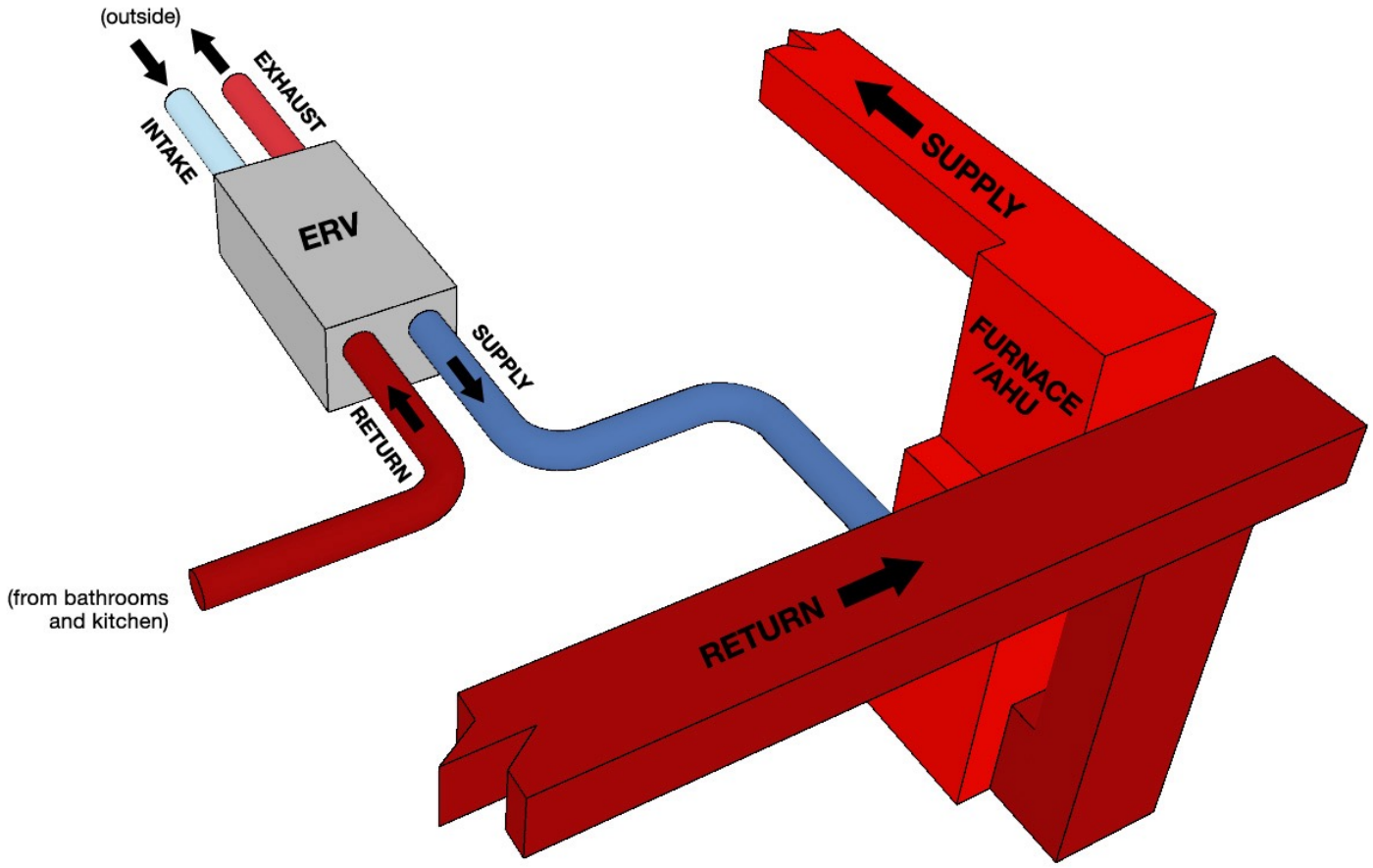
The Outdoor Air (ODA) and Exhaust Air (EHA) ducts are always dedicated to the HERV system. But the Supply Air (SUP) and Return (or Extract) Air (ETA) ducts can be integrated with the heating/cooling ducting in various ways.



Return Integration

Supply Air from the HERV is injected into the return plenum of the furnace/air handler.

The HERV has its own dedicated Return Air ductwork.



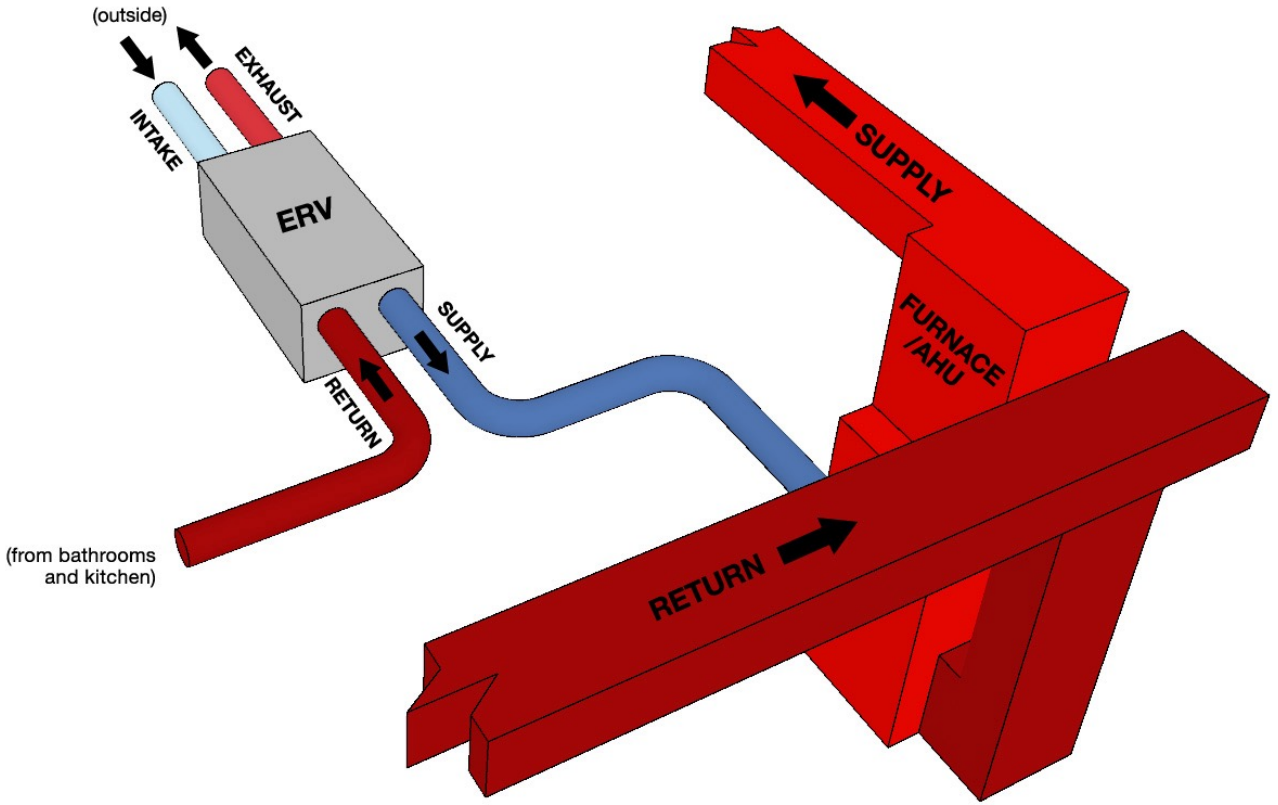
Return Integration: Disadvantages

With the air handler running…

- The HERV Supply Air is mixed in with the heating/cooling and supplied to every room (not targeted).

With the air handler NOT running…

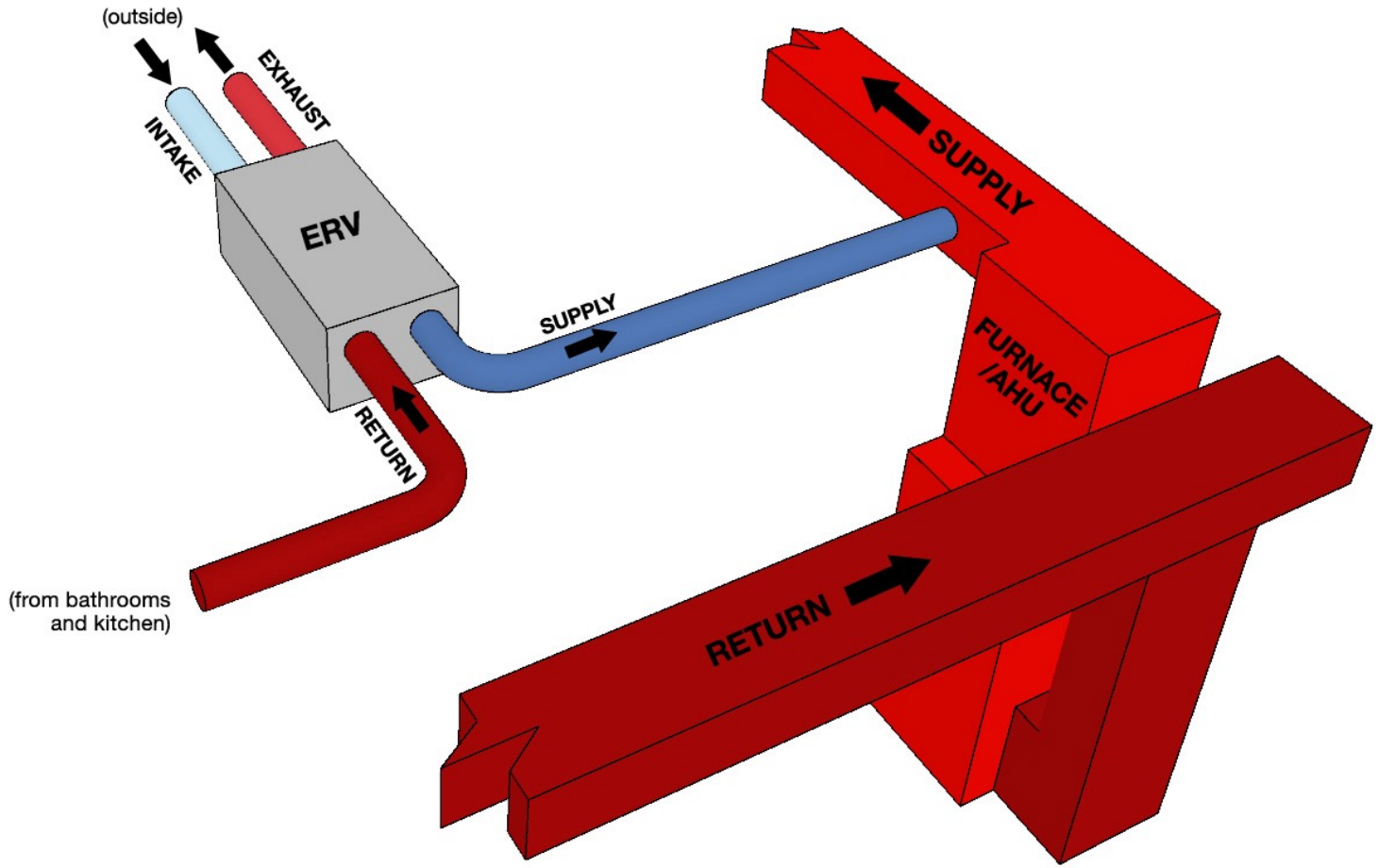
- The HERV Supply Air flow rate will be too low for the air handler ductwork and will most likely find its way out of the closest couple of vents, possibly even return vents (again, not targeted). Performance will be unpredictable.



Supply Integration

Supply Air from the HERV is injected into the supply plenum of the furnace/air handler.

The HERV has its own dedicated Return Air ductwork.



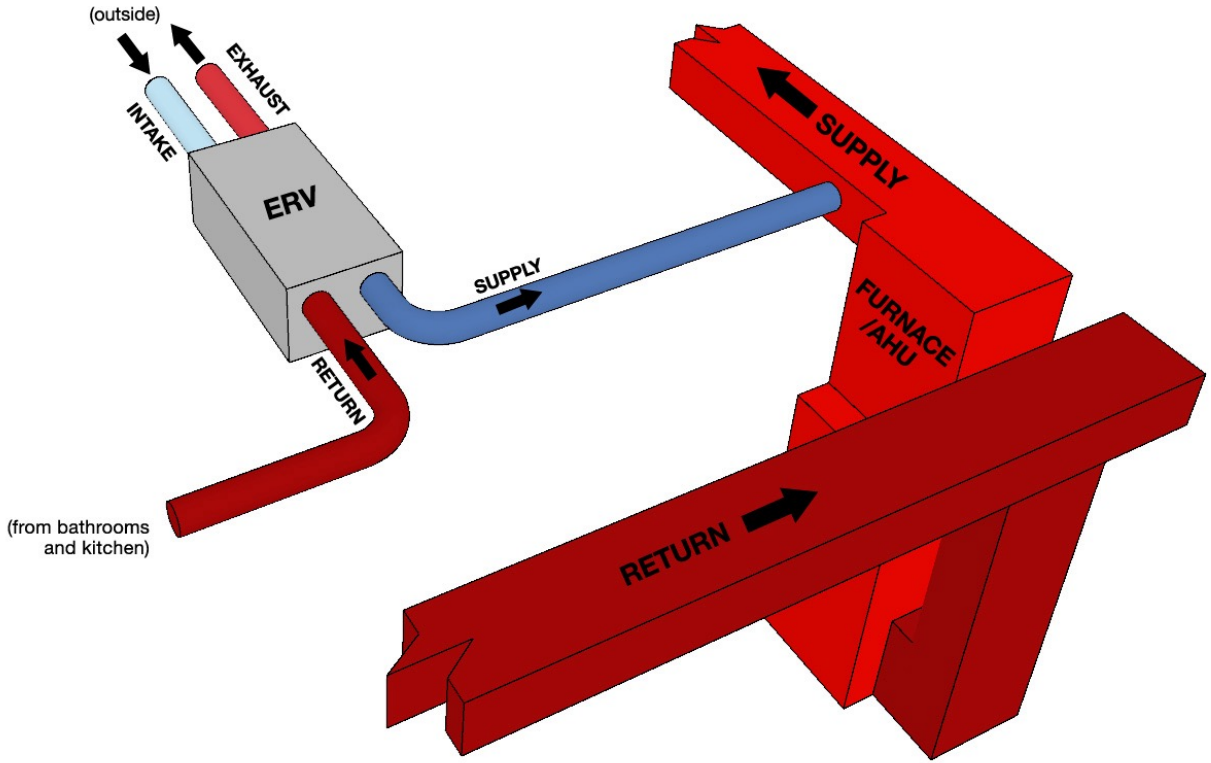
Supply Air Integration: Disadvantages

With the air handler running…

- The HERV Supply Air is mixed in with the heating/cooling and supplied to every room (not targeted).
- In hot, humid climates, the humidity remaining in the ERV Supply Air may condense inside the AC supply ductwork.

With the air handler NOT running…

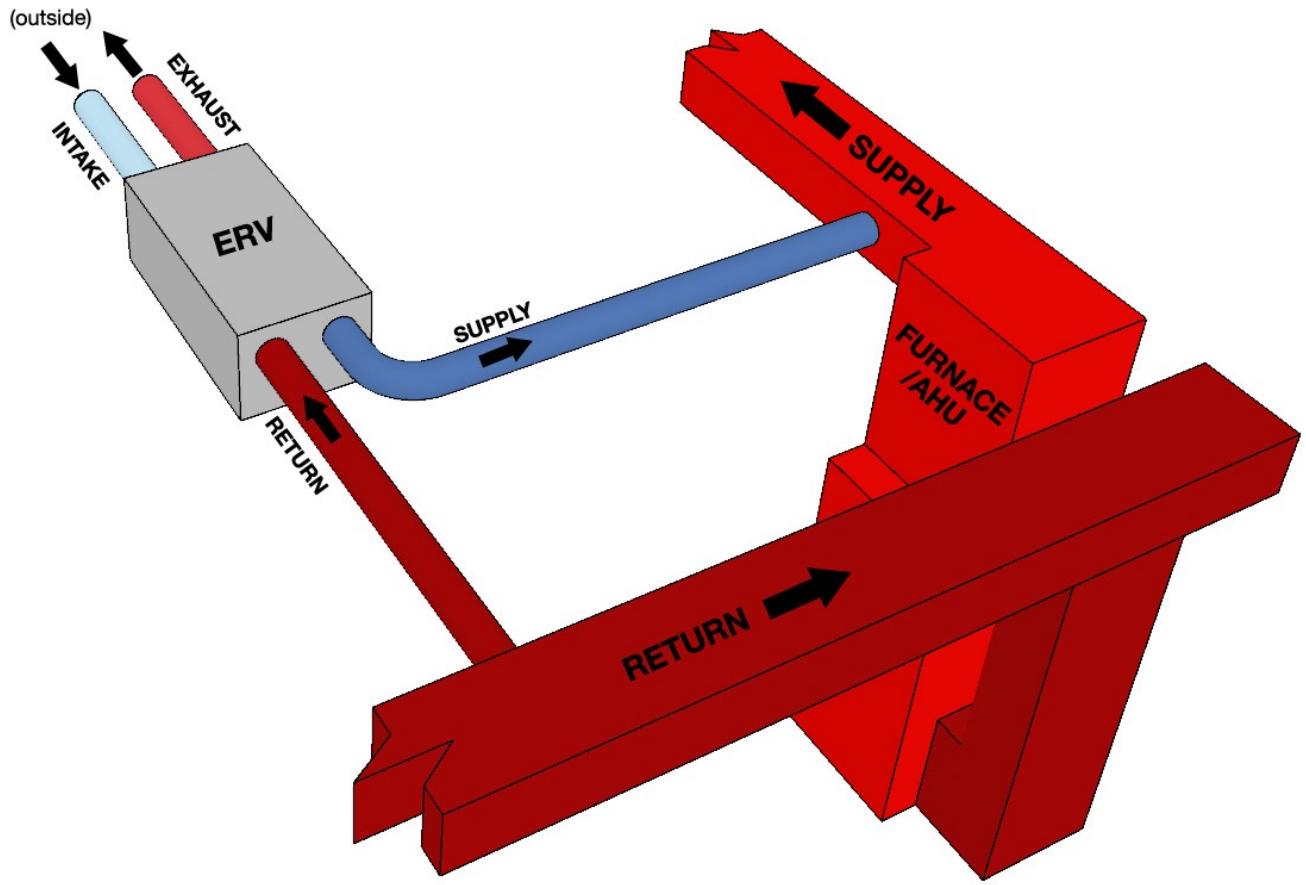
- the HERV Supply Air flow rate will be too low for the air handler ductwork and will most likely find its way out of the closest couple of vents (again, not targeted). Performance will be unpredictable.



Return-Supply Integration

Supply Air from the HERV is injected into the supply plenum of the furnace/air handler.

The HERV Return Air is pulled from the return plenum of the furnace/air handler.



Return-Supply Integration: Disadvantages

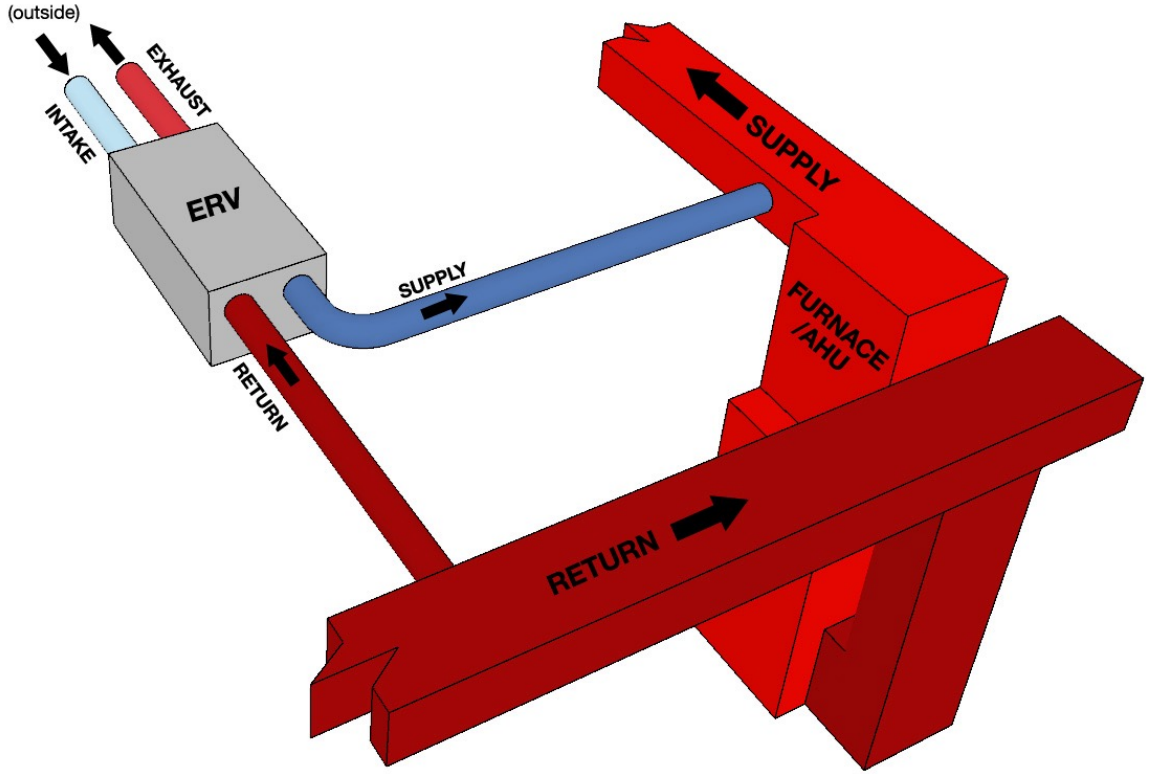
No dedicated ducting for HERV return means bathroom exhaust fans must also be used, wasting energy.

With the air handler running…

- the HERV Supply Air is mixed in with the heating/cooling and supplied to every room (not targeted).
- In hot, humid climates, the humidity remaining in the ERV Supply Air may condense inside the AC supply ductwork.

With the air handler NOT running…

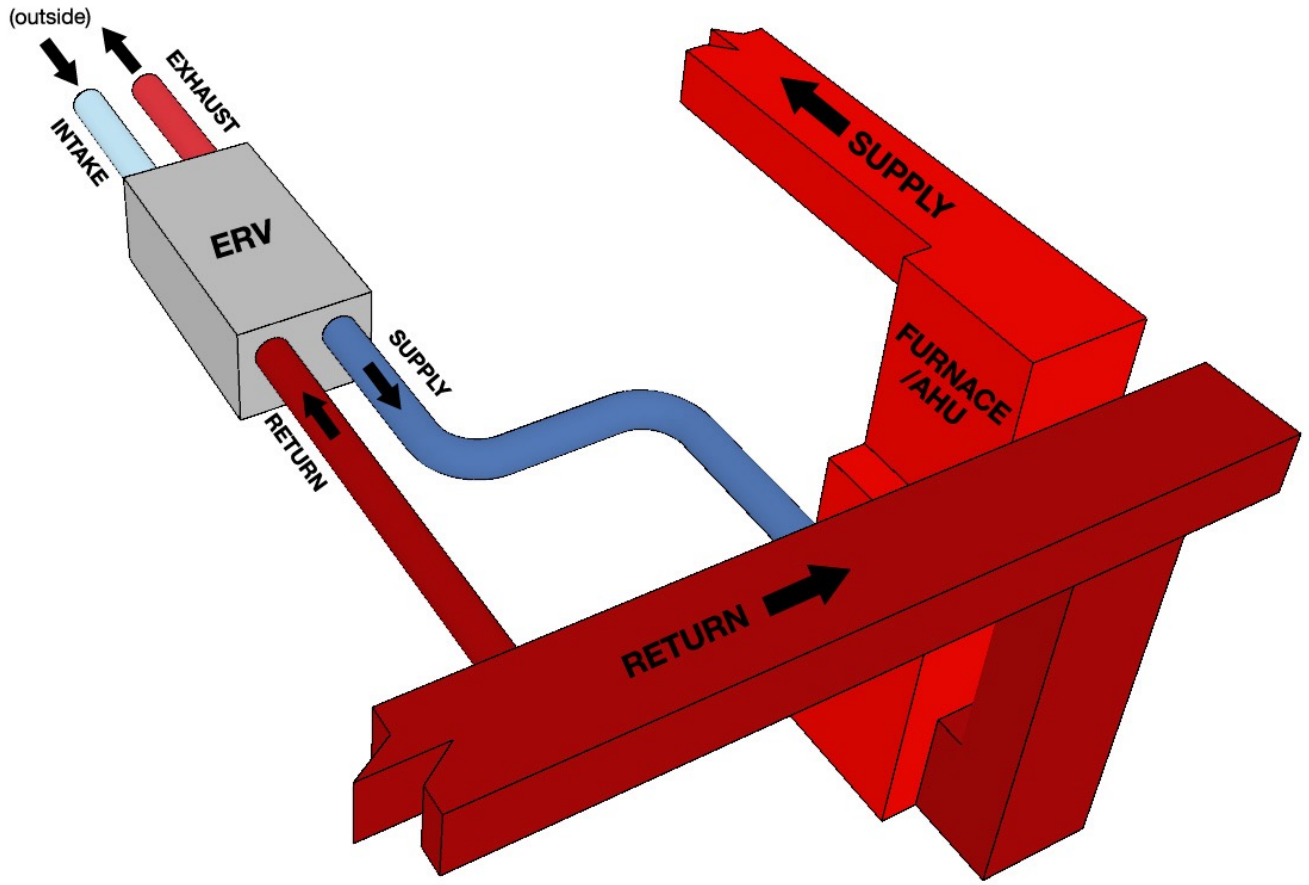
- the HERV Supply Air flow rate will be too low for the air handler ductwork and will most likely find its way out of the closest couple of vents (again, not targeted).
- HERV Supply Air may possibly backdraft through the furnace/air handler, “short circuiting” back into the HERV Return Air. Performance will be unpredictable.



Return-Return Integration

Supply Air from the HERV is injected into the return plenum (closer to the furnace/air handler).

The HERV Return Air is pulled from the return plenum (further away from the furnace/air handler.



Return-Return Integration: Disadvantages

No dedicated ducting for HERV return means bathroom exhaust fans must also be used, wasting energy.

With the air handler running…

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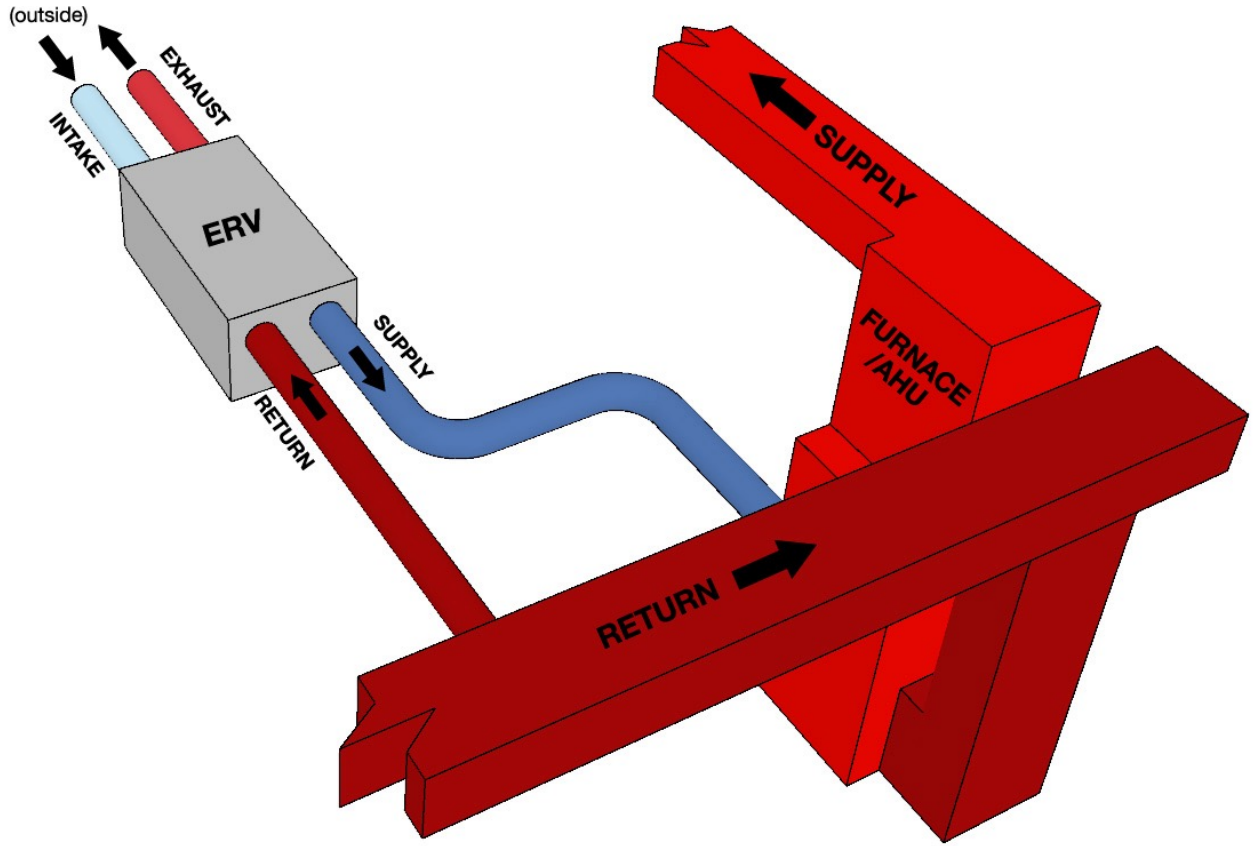
With the air handler NOT running…

- The HERV Supply Air flow rate will be too low for the air handler ductwork and will most likely find its way out of the closest couple of vents (again, not targeted), or even more likely...
- HERV Supply Air may simply backdraft through the return plenum, “short circuiting” back into the HERV Return Air. Performance will be unpredictable.

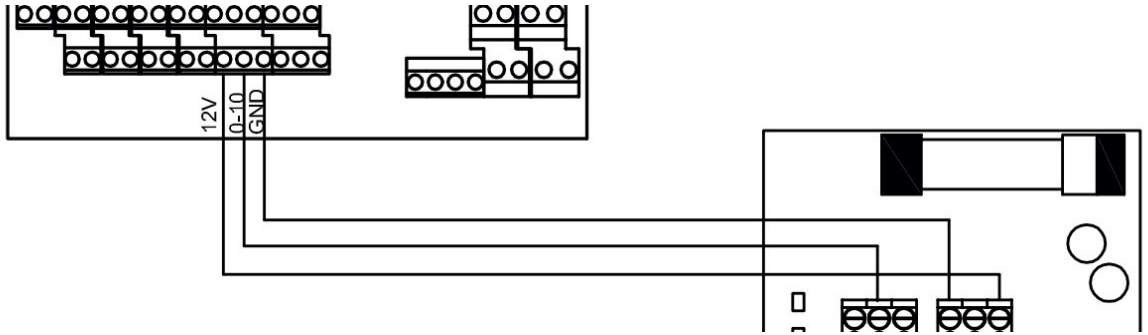


Integrated Controls

Some of the disadvantages that have been pointed out with the various integrated configurations can be addressed by integrating the HERV and air handler controls as well as the ductwork and making the air handler blower run whenever the HERV runs.

Disadvantages of integrated controls…

- Still not targeting the ventilation to specific rooms.
- Some configurations still require bathroom exhaust fans, wasting energy.
- Additional energy is consumed running the air handler blower at times when there's no call for heating or cooling.



Advantages of Integration

Integrating the HERV with air handler ductwork is not ideal, but it does have the following advantages…

- Integrating may save the space of additional ductwork
- Integrating is less work for installers
- Integrating should save money on materials and labor
- Integrating can be done to meet the minimum code requirements in most places

For some people, these advantages outweigh the disadvantages in performance and indoor air quality.

Knowledge Check

Learning Objective 2

Review the pros/cons of ducting an HERV system into a heating/cooling system

How is the integration of ventilation and forced-air heating/cooling systems beneficial?

A. It saves money on materials and labor
B. In most cases integration can meet minimal code requirements
C. It saves the space of additional ducts
D. All of the above

Knowledge Check

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Learning Objective 3

Advocate for stand-alone ventilation systems

Advantages of Stand-Alone Systems

The advantages of a ventilation system that uses its own dedicated ductwork fall into three basic categories:

1. Targeted air distribution
2. Operational simplicity
3. Right-sized equipment

Targeted Air Distribution

Installing a stand-alone ventilation system allows for the design of an air distribution network that perfectly matches its function...to maintain optimum Indoor Air Quality.

Rather than compromise on air quality by defaulting to the distribution strategy of the heating and cooling system, exhaust and supply can be targeted separately to the spaces where each is most important for a healthy environment.

Optimizing Exhaust

Because local exhaust is always required in bathrooms and because typical bathroom exhaust fans simply waste energy by expelling conditioned air outside, it's a win-win to use the bathroom exhaust as your source of air for energy recovery.

A targeted air distribution system allows you to extract and segregate excess moisture, smells and VOCs from bathrooms, kitchens, laundry and storage rooms so they aren't being spread around the house.

Prioritizing Bedrooms

As we saw in the lesson on Indoor Air Quality, the bedroom can be one of the most impactful rooms in the home in terms of air quality. During sleep we spend long hours in the same space while our bodies recover from the day and prepare for the next.

Bedroom air quality degrades over the course of the night, so delivering comfortable ventilation supply air from the H/ERV directly to bedrooms positively impacts daily recovery and long-term health.

Operational Simplicity

Keeping the HERV separate from the heating/cooling system allows the ventilation system to function ideally without consuming more electricity with the central air handler to get predictable results.

Low-speed, continuous ventilation is usually the best operating mode, but it's always nice to be able to simply touch a boost switch to put the system in high speed while using the shower or toilet. This isn't always possible with integrated systems.

Operational Simplicity

With a discreet, dedicated ventilation system, all the components can be sized properly for their function. Ducts and grilles that are designed to handle hundreds of cfm won't be expected to accurately distribute a fraction of the flow or need the air handler to run simultaneously.

A right-sized, lower-flow ventilation system will result in…

- A quieter system.
- More comfort with minimal drafts.
- The ability to commission the system for all operating conditions.

Knowledge Check

Learning Objective 3

Advocate for stand-alone ventilation systems

Why is direct supply air to bedrooms prioritized in stand-alone ventilation systems?

A. Fresh air supply during sleep can improve health and brain function
B. There is no reason other than design style choice
C. There are usually more bedrooms than other rooms in a house
D. Bedrooms are usually where clothing is stored

Knowledge Check

Learning Objective 3

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Thank you for taking this Learning Segment. We hope you found it informative.

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