2024 IECC Residential Energy Code Mechanical Ventilation

Rhode Island Energy™
Efficiency Programs

With the adoption of the 2024 International Energy Conservation Code (IECC), mechanical ventilation is now required in all new residential construction in Rhode Island.
Reference: 2024 IRC Chapter 11 – N1103.6 (R403.6) Mechanical Ventilation

Random Ventilation

Historically, most homes in Rhode Island rely on "random ventilation", the natural air movement through cracks, gaps, and holes in the building envelope.



Picture from Fine Homebuilding

How does that work?
The primary mechanism is known as the **stack effect**. Warm, stale indoor air rises and escapes through small openings in the ceiling and upper walls. In turn, cooler outside air is drawn in through gaps near the floor or foundation. It functions much like a chimney.

But how effective is it?

- There's **no reliable way to measure** the amount of air being exchanged
- The airflow is **uncontrolled and unpredictable**—we don't know where the air is coming from, how much is entering or leaving, or what's in it. Air carries more than just oxygen: it also transports **heat, moisture, and pollutants** like radon, mold spores, carbon monoxide, fine particles (PM2.5), pollen, etc.
- In cold weather, warm interior air can escape into unconditioned spaces like attics, where it may **condense on cold surfaces**, potentially causing mold, mildew, and structural damage
- Incoming "fresh" air is cold in winter and hot in summer, increasing heating or cooling demand and potentially reducing comfort

Clearly, relying on passive air leakage isn't an effective or healthy ventilation strategy—especially in today's tighter, more energy-efficient homes.

Mechanical Ventilation

Mechanical ventilation provides **controlled, predictable, and measurable** airflow. We can track exactly how much air is entering and exiting the home using **Air Changes per Hour (ACH)**.

Example:
Let's take a 2,500-square-foot, single-story home with 8-foot ceilings—totaling 20,000 cubic feet of air volume.
If we install an ERV (Energy Recovery Ventilator) set to move 120 CFM (cubic feet per minute):

ACH = (120 CFM × 60 minutes) ÷ 20,000 ft³ = 0.36 ACH

That means the stale air inside the home is replaced completely with fresh, filtered air **8.64 times per day.**
Compare that to random air leaks. Can uncontrolled cracks and holes reliably deliver that level of air exchange, comfort, and air quality? Absolutely not.

Three Types of Mechanical Ventilation Systems

1. **Exhaust-Only Ventilation**
   - A low-speed fan (typically a bath fan) runs continuously or for extended periods, expelling stale air
   - This creates **negative pressure**, pulling outside air in through cracks and gaps

   Drawbacks:
   - Uncontrolled and unfiltered air entry
   - Significant heat loss in winter and heat gain in summer
   - Potential for backdrafting combustion appliances
   - Inconsistent air distribution and pressure imbalances
   - Can lead to increased humidity in summer and dryness in winter

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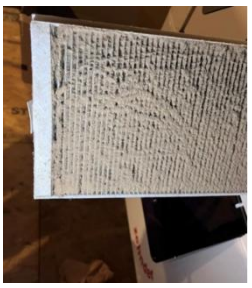
2. **Supply-Only Ventilation**
   - A fan brings in fresh outdoor air, creating **positive pressure** to force stale air out through cracks

   Concerns:
   - Discouraged in cold climates - moist interior air can be pushed into wall cavities, where it may condense and cause damage
   - Still lacks control over exhaust air location



3. **Balanced Ventilation (ERV/HRV Systems)**
   - This is the **preferred method**, especially in cold climates
   - ERVs (Energy Recovery Ventilators) and HRVs (Heat Recovery Ventilators) **bring in fresh air and exhaust stale air at equal rates**, keeping air pressure balanced inside the home

   Benefits:
   - Controlled airflow: we know **where air comes from and where it goes**
   - Maintains **balanced pressure,** reducing the risk of moisture moving into walls or ceilings
   - Includes **filtration**, improving indoor air quality
   - Recovers heat (and in the case of ERVs, some moisture), reducing energy use and maintaining comfort
     - In winter, ERVs help prevent over-drying
     - In summer, they help reduce humidity



Picture from Steve DeMetrick

Installation Best Practices for ERV/HRV Systems

To ensure optimal performance:

- **Use a dedicated duct system**—do not tie into HVAC ductwork unless specifically designed for it – incompatible duct sizing can cause issues with distribution
- **Ducts to the outdoors** (both supply and exhaust) must be:
  - Short and direct (to reduce energy loss)
  - **Insulated and air sealed**
  - Equipped with a **vapor barrier**
- Locate the unit where **filters are easily accessible**
- Keep **fresh air intakes** away from driveways, exhaust vents, and other sources of contamination
- **Supply fresh air** to bedrooms and living spaces
- **Exhaust stale air** from bathrooms, kitchens, and utility rooms
  - In many cases, an ERV can serve as the primary bath fan, eliminating the need for separate exhaust systems
- **Commission and balance the system** after installation to ensure it is delivering proper airflow and achieving intended performance

Summary

As building codes evolve, so must our approach to ventilation. Passive air leaks are no longer acceptable. Mechanical ventilation, especially balanced systems using ERVs or HRVs, delivers superior air quality, moisture control, energy efficiency, and comfort.