Heat Recovery Ventilator and Energy Recovery Ventilator Fact Sheet

International Energy Conservation Code – Residential (One and Two Family Homes and Multifamily Three Stories or Less) 2018

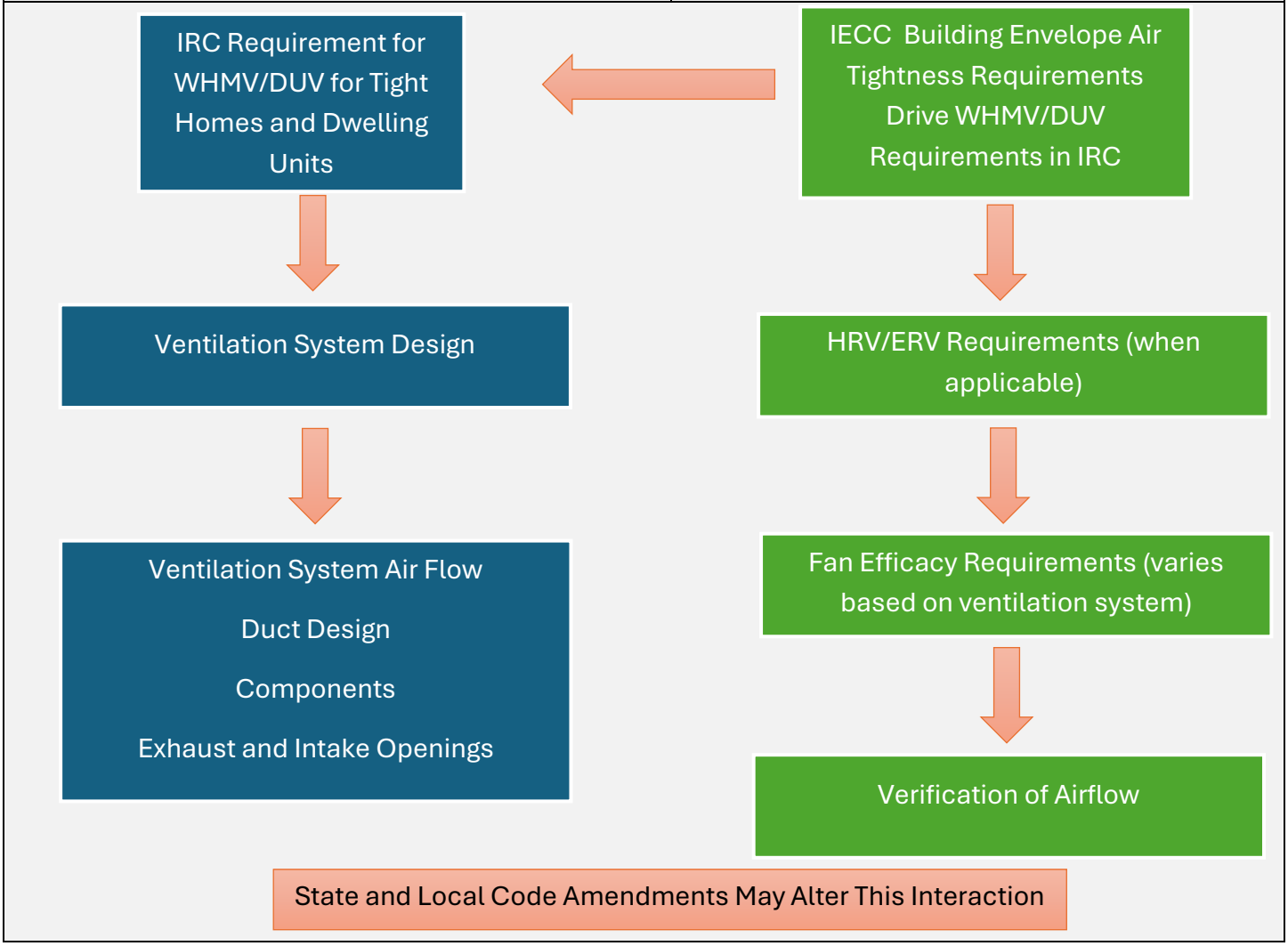
HVI HOME VENTILATING INSTITUTE

HRV/ERV Code Primer

Background: Requirements for WHMV/DUV in one and two family homes in the Code that lead to HRV/ERV installations are primarily established by two ICC codes – the IRC and IECC. A combination of both codes (IECC setting building envelope air tightness requirements, and IRC setting WHMV/DUV requirements for tight homes and dwelling units) is often needed for the code to require all homes and dwelling units to install a WHMV/DUV system – a requirement that could be met by an HRV/ERV.

With this requirement established, the IRC provides specific requirements related to ventilation airflow, ducting, terminations, and components. The IECC provides specific requirements for energy recovery, fan efficacy, and air flow verification. This fact sheet provides guidance on how to find WHMV/DUV efficiency requirements that are relevant to HRVs/ERVs. Note that upon adoption, state and local jurisdictions may amend the code, or adopt different IRC and IECC code editions that will change the interaction between the codes on these issues. For dwelling units in multifamily buildings, the IMC instead of the IRC would establish ventilation requirements.

IRC (See Separate Fact Sheet)	**IECC**



Source: All information can be directly accessed through the ICC at https://codes.iccsafe.org/

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HRV/ERV Allowed?	**HRV/ERV Satisfies WHMV/DUV Requirements?**
YES — No prohibition of HRV/ERV in IECC	YES — HRV/ERV satisfies requirements for WHMV/DUV. Specific requirements that apply to HRV/ERV are detailed in this fact sheet.
WHMV/DUV Required?	**House / Dwelling Unit Building Envelope Air Tightness (Blower Door) Testing Required?**
YES — IECC R403.6 sets efficiency requirements for WHMV/DUV IRC R303.4 Establishes requirement to install WHMV/DUV	YES — IECC R402.4 requires air leakage ≤ 5ACH50 CZ 1-2 ≤ 3ACH50 CZ 3-8
WHMV applies to all buildings air sealed to 5ACH50 or tighter	
Note: IECC 402.4 and IRC R303.4 requirements for WHMV/DUV as well as requirements for blower door testing have been commonly amended during state/local adoption in every code edition starting in 2012.	

Efficacy ≥ 1.2 CFM/Watt

Tested according to HVI 916

Listed

Required for HRVs and ERVs
IECC R403.6.1
&
Table R403.6.1

H/ERV Required?

NO

Note: see IRC M1505.4.1 for ventilation type options which include, but are not limited to H/ERV.

WHMV/DUV Aiflow Testing/Field Verification Required?

NO

Recommended Resource: See IRC for required air flows	Recommended Resource: See HVI CPD listing for CFM/Watt ratings

IECC R303.3: Systems Requiring Maintenance	**IECC R403.6**: Outdoor air intakes and exhausts have:
❖ Supply maintenance instructions ❖ Required regular maintenance on readily visible label ❖ Label points to title or publication number for manual Note: Broad requirement for any equipment – not limited to ventilation or HRV/ERV systems	❖ Automatic damper, or ❖ Gravity damper Damper closes when ventilation not operating
Inspections and Compliance Documentation	
IECC R105.2.4 requires mechanical rough-in inspection which includes mechanical ventilation systems.	IECC 103.2 item 6 requires mechanical equipment size, type, and efficiency to be listed on construction/permit documents.

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The Role of HRV/ERV in Alternative Performance Compliance Paths

(Energy simulation performed to measure whole house or dwelling unit efficiency with additional flexibility)

IECC R405 Total Building Performance Compliance Option

(Energy cost simulation or alternatively source Btu or Btu per square foot; compares proposed design to a standard reference design)

WHMV/DUV Required for This Option?

YES

IECC R403.6 ventilation requirements are mandatory
IECC R405.2 requires all mandatory items for this compliance path. Mandatory items include WHMV/DUV requirement and fan efficacy

Does HRV or ERV Provide R405 Compliance Flexibility?

YES

HRV/ERV compared to balanced ventilation without recovery achieving savings relative to the standard reference design

Note: system compared against baseline system assuming minimum fan efficacy listed in IECC Table R403.6.1 and ventilation air flow rated defined in the IRC). HRV/ERV with better fan efficacy and recovery will show savings compared to the standard reference design, adding compliance flexibility

IECC R406 ERI Compliance Option

(energy rating index calculated based on ANSI/RESNET/ICC Standard 301; typically requires specialized training and certification to access software; compares proposed design to a 2006 IECC minimum design)

WHMV/DUV Required for This Option?

YES

IECC R403.6 ventilation requirements are mandatory
IECC R406.2 requires all mandatory items for this compliance path. Mandatory items include WHMV/DUV requirement and fan efficacy

Does HRV or ERV Provide R406 Compliance Flexibility?

YES

HRV/ERV achieve lower ERI score (lower is better), allowing user to achieve target score more easily

Note: in many cases, homes or dwelling units modeled with an HRV/ERV will achieve a better ERI compared to the baseline home which does not include balanced ventilation or recovery. HRV/ERV may show higher appliance energy use due to balanced nature of the appliance but lower heating and/or cooling energy for an overall energy reduction. HRV/ERV in most climate zones for most homes will achieve several ERI points.
Note: ERI Targets are commonly amended during state/local adoption

Frequently Asked Questions

❖ Does code require insulation of ventilation ducts outside of conditioned space?

Answer: Duct insulation requirements have not been historically applied to ventilation ducts. However, without an explicit exception, it is always a good idea to check with the AHJ. (IECC R403.3.1)

❖ Does code require duct leakage testing of ventilation ducts?

Answer: Ventilation ducts NOT integrated with heating and cooling system ducts are specifically exempted (IECC R403.3.5)

❖ Do duct penetrations through the air barrier have to be air sealed?

Answer: IECC Table R402.4.1.1 requires that duct shafts and flues, as well as utility penetrations, be air sealed using materials that allow for expansion, contraction, and mechanical vibration. Likewise, heating, cooling, and ventilation register boots that penetrate the air barrier must be sealed to the finished surface of the space (e.g. drywall, etc)

Fact Sheet Acronyms

ACH50 = Air Changes per Hour at 50 Pascals Pressure
AHJ = Authority Having Jurisdiction
ANSI = American National Standards Institute
Btu = British thermal unit
CFM = Cubic Feet per Minute
CPD = Certified Products Directory
CZ = Climate Zone
DUV = Dwelling Unit Ventilation
ERI = Energy Rating Index
ERV = Energy Recovery Ventilator
HRV = Heat Recovery Ventilator
HVI = Home Ventilating Institute
ICC = International Code Council
IECC = International Energy Conservation Code
IMC = International Mechanical Code
IRC = International Residential Code
LRMT = Latent Recovery Moisture Transfer
RESNET = Residential Energy Services Network
WC = Water Column
WHMV = Whole House Mechanical Ventilation

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Important Change in 2018 IECC: An HRV/ERV-Specific efficacy was added to Table R403.6.1 requiring ≥ 1.2 CFM/Watt efficacy. In prior code editions, an HRV/ERV would have had to comply with the in-line fan row in this table with an efficacy ≥ 2.8 CFM/Watt. This change fixed a disadvantage for HRV/ERVs which technically eliminated most models from serving as the WHMV/DUV system due to the balanced nature of HRV/ERV systems, and limited models meeting the in-line fan requirement.
Notes: For any interpretation question, please discuss with the AHJ for their official ruling.

Important Resources

- HVI CPD https://www.hvi.org/hvi-certified-products-directory/
- ASHRAE Read-Only Standards https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards
- ICC Codes https://codes.iccsafe.org/ for actual code text and other codes referenced throughout IECC
- State and/or Local Code Adoption Information – check with your state and/or local building department for adopted code edition and any amendments. Depending on the AHJ, requirements may be significantly amended from ICC published code

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