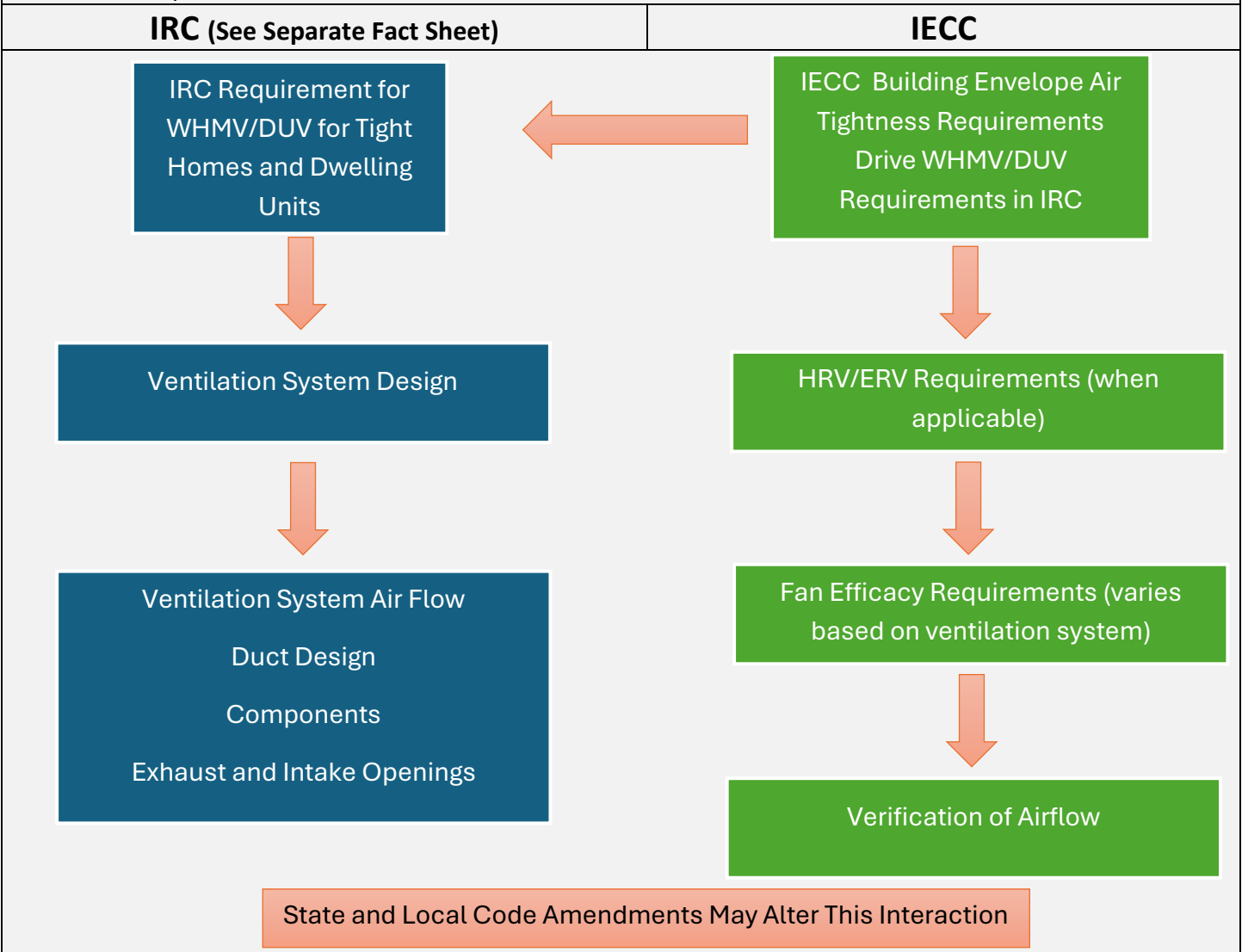




HRV/ERV Code Primer

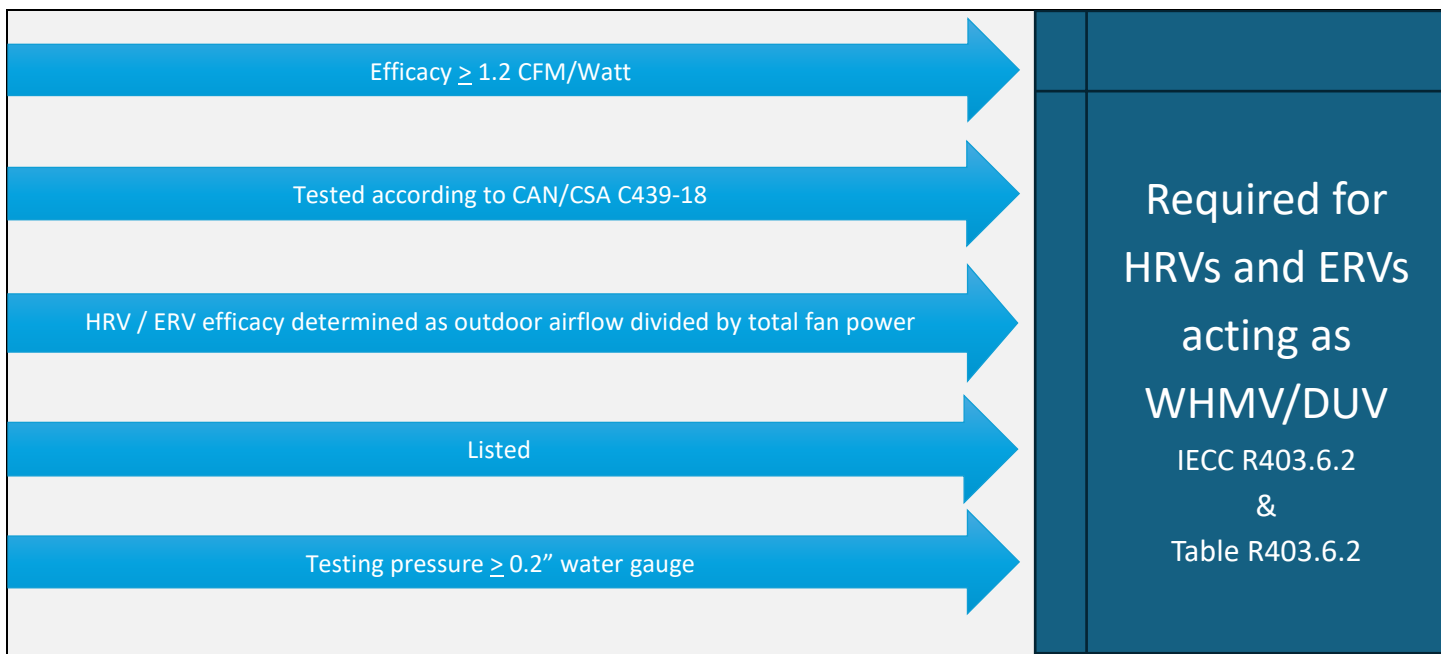
Background: Requirements for WHMV/DUV in one and two family homes in the Code that lead to HRV/ERV installations are primarily established by two ICC codes – the IRC and IECC. A combination of both codes (IECC setting building envelope air tightness requirements, and IRC setting WHMV/DUV requirements 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.





HRV/ERV Allowed? YES No prohibition of HRV/ERV in IECC		HRV/ERV Satisfies WHMV/DUV Requirements? YES HRV/ERV satisfies requirements for WHMV/DUV. Specific requirements that apply to HRV/ERV are detailed in this fact sheet.		
WHMV/DUV Required? YES IECC R403.6 sets efficiency requirements for WHMV/DUV IRC R325.3 Establishes requirement to install WHMV/DUV		House / Dwelling Unit Building Envelope Air Tightness (Blower Door) Testing Required? YES Primary Test Option: IECC R402.5.1.2 Prescriptive Compliance: ≤ 4ACH50 CZ 0, 1, 2 ≤ 3ACH50 CZ 3-5 ≤ 2.5 ACH50 CZ 6-8 R405 or R406 Compliance: ≤ 4ACH50		
HRV/ERV Required? YES CZ 6-8 HRV/ERV must be: <ul style="list-style-type: none"> ❖ Balanced ❖ Have an SRE ≥ 65% at 32°F at an airflow ≥ the design air flow ❖ SRE is determined by listed value or interpolation of listed value 		Additional Prescriptive Option for Blower Door Test (Encapsulation test instead of ACH commonly applied to attached dwellings or dwelling units < 1500 Ft²): ≤ 0.27 CFM50 / Ft² of Enclosure Area detached dwelling units ≤ 1500 Ft² or any attached dwelling units R405 Or R406 Compliance ≤ 0.22 CFM / FT² of Enclosure Area		
Recommended Resource: See IRC for required air flows		Only Applies to Climate Zone 6-8 Requirement IECC R403.6.1	Recommended Resource: See HVI CPD for SRE	Note: Sampling Allowed (R402.5.1.2.1) for buildings with 8+ dwelling or sleeping units
Note: 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.				
Ventilation Flow Rate Testing Required? YES		IECC 403.6.3 Verification of required flow rates for WHMV/DUV in Accordance with ANSI/RESNET/ICC 380, which allows		
Note: AHJ may require approved third party to conduct testing including signed report		Measure at inlet terminals Using: <ul style="list-style-type: none"> ❖ Powered flow hood ❖ Airflow resistance device ❖ Passive Flow Hood ❖ Vane anemometer with hood 	Measure at outlet terminals Using: <ul style="list-style-type: none"> ❖ Powered flow hood ❖ Bag inflation device ❖ Vane anemometer with hood 	Measure midstream in the ventilation duct Using: <ul style="list-style-type: none"> ❖ Airflow measurement station ❖ Velocity pressure probe ❖ Hot wire anemometer
		At the equipment using an integrated diagnostic tool Maximum error of 15% of the highest flow setting of the ventilation equipment		
Relevant Exception: ventilation system has integrated diagnostic tool used for air flow measurement AND ventilation system has a user interface that communicates the installed airflow rate Note: This exception is duplicative – ANSI/RESNET/ICC 380 already allows this, but could be read as a limitation on 380 Note: Sampling allowed (IECC R403.6.4) for buildings with 8+ dwelling or sleeping units				



Recommended Resource: See HVI CPD for listing and for CFM/Watt ratings

Note: Range hoods, bath fans, and utility room fans testing pressure ≥ 0.1 " water gauge

R408 Additional Efficiency Packages

Packages	Credits by Climate Zone								
	CZ0	CZ1	CZ2	CZ3	CZ4	CZ5	CZ6	CA7	CZ8
R408.2.5(1) HRV or ERV installed	0	0	0	0	1	3	2	2	2
R408.2.5(2) envelope leakage ≤ 2 ACH50 with HRV or ERV installed	0	0	0	4	4	8	5	5	5
R408.2.5(4) envelope leakage ≤ 1.5 ACH50 with HRV or ERV installed	0	0	0	6	5	10	9	9	9
R408.2.5(5) envelope leakage ≤ 1 ACH50 with HRV or ERV installed	0	0	1	7	6	12	12	12	12

Note: all projects using the Prescriptive Compliance Option must choose at least (2) measures that receive (10) credits. Credits are specific to climate zones. HRV and ERV packages satisfying the following requirements achieve the credits shown in the table to the left. Requirements at lowest net air flow:

- $\geq 75\%$ SRE
- CZ 8 no recirculation defrost
- ERV $\geq 50\%$ LRMT at lowest listed airflow

Note: Additional efficiency packages have been amended in local adoptions.



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 or site Btu or Btu per square foot; compares proposed design to a standard reference design)	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?	WHMV/DUV Required for This Option?
<div style="background-color: #0070C0; color: white; padding: 10px; font-weight: bold; font-size: 24px; text-align: center;">YES</div> IECC Table R405.2 All WHMV/DUV requirements apply to this compliance path	<div style="background-color: #0070C0; color: white; padding: 10px; font-weight: bold; font-size: 24px; text-align: center;">YES</div> IECC Table R406.2 All WHMV/DUV requirements apply to this compliance path
Does HRV or ERV Provide R405 Compliance Flexibility?	Does HRV or ERV Provide R406 Compliance Flexibility?
<div style="background-color: #0070C0; color: white; padding: 10px; font-weight: bold; font-size: 24px; text-align: center;">YES</div> HRV/ERV in CZ 1-5 compared to balanced ventilation without recovery achieving savings relative to the standard reference design. HRV/ERV in CZ 6-8 compared to HRV/ERV within minimum allowed specification (per R403.6.1) due to mandatory requirement	<div style="background-color: #0070C0; color: white; padding: 10px; font-weight: bold; font-size: 24px; text-align: center;">YES</div> HRV/ERV achieve lower ERI score (lower is better), allowing user to achieve target score more easily
Note: system compared against baseline system assuming minimum fan efficacy listed in IECC Table R403.6.2 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	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.
IECC R303.3: Systems Requiring Maintenance <ul style="list-style-type: none"> ❖ 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	IECC R403.6: Outdoor air intakes and exhausts have: <ul style="list-style-type: none"> ❖ Automatic damper, or ❖ Gravity damper Damper closes when ventilation not operating
Inspections and Compliance Documentation	
IECC R107.2.4 requires mechanical rough-in inspection which includes mechanical ventilation systems.	IECC 105.2 item 6 requires mechanical equipment size, type, and efficiency to be listed on construction/permit documents.



Frequently Asked Questions	Fact Sheet Acronyms
<p>❖ 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)</p> <p>❖ 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)</p> <p>❖ 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)</p>	<p>ACH50 = Air Changes per Hour at 50 Pascals Pressure AHJ = Authority Having Jurisdiction ANSI = American National Standards Institute Btu = British thermal unit CAN/CSA = Canadian Standards Network 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 SRE = Sensible Recovery Efficiency RESNET = Residential Energy Services Network WHMV = Whole House Mechanical Ventilation</p>
<p>Notes: For any interpretation question, please discuss with the AHJ for their official ruling.</p>	
<p>Important Resources</p> <ul style="list-style-type: none"> ❖ 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 	