



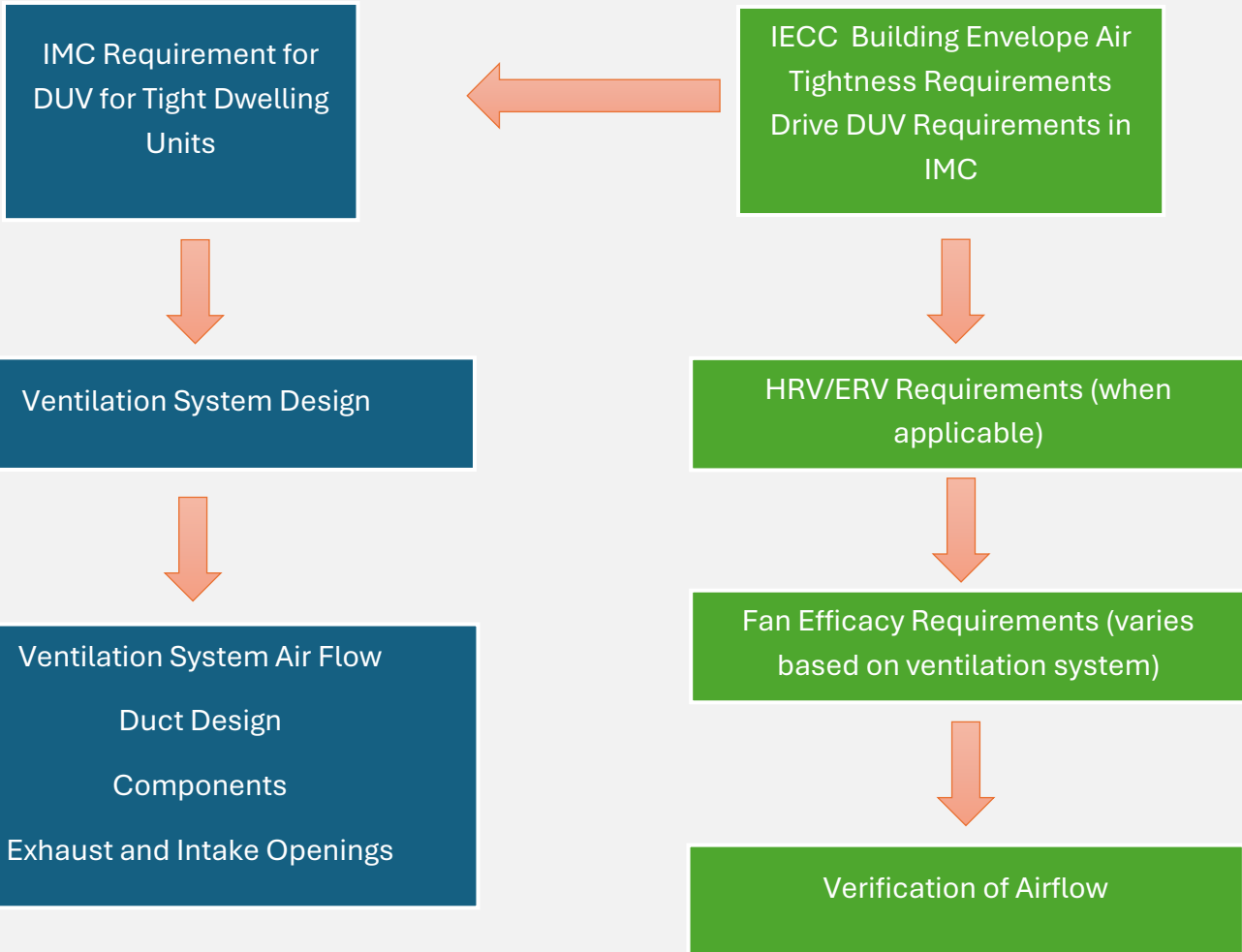
HRV/ERV Code Primer

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

With this requirement established, the IMC 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 DUV efficiency requirements that are relevant to HRVs/ERVs. Note that upon adoption, state and local jurisdictions may amend the code, or adopt different IMC and IECC code editions that will change the interaction between the codes on these issues.

IMC (See Separate Fact Sheet)

IECC



State and Local Code Amendments May Alter This Interaction



HRV/ERV Allowed?	HRV/ERV Satisfies WHMV/DUV Requirements?
YES No prohibition of HRV/ERV in IECC	YES HRV/ERV satisfies requirements for DUV. Specific requirements that apply to HRV/ERV are detailed in this fact sheet.
DUV Required?	Whole Building or Dwelling Unit Enclosure Air Tightness (Blower Door) Testing Required?
YES IMC 401.2 DUV applies to all dwellings meeting IECC air sealing requirements IECC C403.2.2 also requires ventilation meeting IMC	YES C402.6.2 Two Options: <ul style="list-style-type: none"> • Whole building air leakage ≤ 0.35 CFM/ft² of building thermal envelope surface area at 75 Pa pressure • Dwelling Unit air leakage ≤ 0.27 CFM/ft² of testing unit enclosure area at 50 Pa pressure Note: Buildings in CZ 2B are exempt

C402.6.2.2 Dwelling Unit Air Tightness Sampling	<ul style="list-style-type: none"> ❖ Buildings ≥ 8 dwelling units ❖ 7 Units or 20% tested, whichever is greater ❖ Required testing of top floor unit, ground floor unit, and unit with largest enclosure area
	Note: Due to the complication of testing large buildings, state and local jurisdictions are likely to amend this section.

Balanced Ventilation with Energy Recovery Required for Most Dwelling Units

DUV Energy Recovery Required? C403.7.4; C403.7.4.1	Enthalpy recovery ratio $\geq 50\%$ at Cooling design condition	Enthalpy recovery ratio $\geq 60\%$ at heating design condition
(Exceptions for smaller units and specific climates)	Exceptions for heating/cooling design condition requirements	
CZ 0, 1, 2 dwellings ≤ 500 ft ² CFA	NR	NA
CZ 0, 1, 2 dwellings > 500 ft ² CFA	✓	NR
CZ 3A/3B dwellings ≤ 500 ft ² CFA	NR	NA
CZ 3A/3B dwellings > 500 ft ² CFA	✓	✓
CZ 3C dwellings (all sizes)	NR	NA
CZ 4A/4B dwelling (all sizes)	✓	✓
CZ 4C dwellings ≤ 500 ft ² CFA	NR	NA
CZ 4C dwellings > 500 ft ² CFA	✓	✓
CZ 5A/5B dwelling (all sizes)	✓	✓
CZ 5C dwellings ≤ 500 ft ² CFA	NR	NA
CZ 5C dwellings > 500 ft ² CFA	✓	✓
CA 6, 7, 8 dwellings (all sizes)	✓	✓

Required HRVs and ERVs: SRE $\geq 65\%$ at 32°F

CZ 0A, 1A, 2A, 3A NMT $\geq 40\%$ at 95°F

SRE and NMT from listed value or interpolation of listed value at \geq design air flow tested to CAN/CSA C439

Note: Balanced ventilation and energy recovery requirements are likely to be amended during state or local adoption
 Recommended Resource: IECC Commercial does not require HVI testing or listing. However, HVI CPD is an available resource for information regarding efficiency requirements.

Recommended Resource: See IMC for ventilation air outdoor air flow requirement



C403.7.3 Ventilation Air Heating Control

Units that provide ventilation to multiple zones & operate in conjunction with heating and cooling systems may not use heat recovery to warm supply air higher than 60°F when majority of zones require cooling.

Shutoff Dampers C403.7.7

<p>Outdoor Air Intake and Exhaust Openings</p>	<p>Non-motorized gravity dampers may be used:</p> <ul style="list-style-type: none"> ❖ Buildings less than 3 stories above grade plane ❖ Buildings of any height in CZ 0, 1, 2, 3 ❖ Exhaust design capacity ≤ 300CFM
<p>Class I motorized damper</p>	<p>Air leakage tested at 249 Pa</p>
<p>Air leakage ≤ 4CFM/Ft² of damper surface area @ 249 Pa</p>	<p>Air leakage ≤ 20CFM/Ft²; damper ≥ 24 in either dimension</p>
<p>Tested in accordance with AMCA 500D</p>	<p>Air leakage ≤ 40CFM/Ft²; damper < 24 in either dimension</p>
<p>Labeled by an approved agency</p>	<p>Tested in accordance with AMCA 500D</p>
<p>Labeled by an approved agency</p>	<p>Labeled by an approved agency</p>

Alternative Compliance Path Options

(Energy simulation measuring building/dwelling unit efficiency with added flexibility)

<p>C407 Simulated Building Performance Compliance Option (Percentage annual energy cost simulation or alternatively site or source Btu; compares proposed design to a standard reference design)</p>	<p>Residential IECC R406 ERI Compliance Option <i>Note: allowed as compliance option for dwelling units without systems that serve more than one dwelling (see C401.2.1) may comply with the RESIDENTIAL ERI Compliance Option.</i></p>
<p>DUV Requirements in Effect for This Option?</p> <p style="text-align: center;">YES</p> <p>Note: C403.7.4.1 exempted from Table C407.2, so energy recovery not required</p>	<p>DUV Requirements in Effect for This Option?</p> <p style="text-align: center;">YES</p> <p>IECC Table R406.2 All DUV requirements apply to this compliance path</p>
<p>Does HRV or ERV Provide C407 Compliance Flexibility?</p> <p style="text-align: center;">YES</p> <p>If HRV/ERV is more efficient than specified in C403.7.4, then credit in the simulation would be gained compared to C403.7.4 specifications.</p>	<p>Does HRV or ERV Provide R406 Compliance Flexibility?</p> <p style="text-align: center;">YES</p> <p>HRV/ERV achieve lower ERI score (lower is better), allowing user to achieve target score more easily</p>
<p>Note: a new row was added in Table 407.4.1(1) for energy recovery. When mechanical ventilation is specified, the standard reference design assumes a unit that meets the requirements in C403.7.4 for energy recovery. Therefore, a unit that is more efficient than the minimum code requirement, or a unit installed in an exempt climate zone, for example, would save energy compared to the standard reference design, providing compliance flexibility in the simulation.</p>	<p>Note: in many cases, 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.</p>
<p><i>Note: buildings may comply with ANSI/ASHRAE/IESNA 90.1 2019 (See C401.2.2), which includes some different ventilation requirements. Compliance with 90.1 in its entirety is required in lieu of IECC compliance. Picking and choosing advantageous requirements between IECC and 90.1 is not permitted.</i></p>	
<p>C406 Additional Efficiency Requirement for Prescriptive Compliance Option – dedicated ventilation system may get points when installed with specific heating and cooling system types. <i>Note: this is a narrow application and will not apply broadly.</i></p> <p>Note: Additional efficiency packages are likely to be amended during state/local adoption</p>	



Requirements that may apply depending on the fan/system	Fact Sheet Acronyms
<ul style="list-style-type: none"> ➤ C403.7.9 DUV <ul style="list-style-type: none"> ○ Heating and cooling system air mover fan serving single dwelling unit not permitted to provide outdoor air ○ Exception: fan efficacy ≥ 1.2 CFM/Watt when no demand for heating and cooling ➤ C403.8.4 Fractional HP motors <ul style="list-style-type: none"> ○ 1/12 HP \geq fan motors ≥ 1 HP have minimum motor efficiency $\geq 70\%$ rated in accordance with DOE 10 CFR 431 ➤ C403.8.5 and Table C403.8.5 low-capacity ventilation fans <ul style="list-style-type: none"> ○ HRV or ERV with fan motors $< 1/12$ HP have minimum efficacy of 1.2 CFM/watt ○ Exception: Ventilation fans that are a component of listed heating and cooling equipment. Note: In multiple sections, the IRC and IMC require heating/cooling equipment to be listed per specific standards. ○ Airflow tested in accordance with CAN/CSA 439 and listed ○ Efficacy listed or derived from listed power and airflow reported on product listing or label ○ Fully ducted HRV/ERV efficacy determined at static pressure ≥ 0.2 inch w.c. ○ HRV/ERV efficacy determined by outdoor air flow divided by total fan power ➤ C403.6 requirements and exceptions for mechanical systems serving multiple zones. 	<p>ACCA = Air Conditioning Contractors of America ACH50 = Air Changes per Hour at 50 Pascals Pressure AHJ = Authority Having Jurisdiction AMCA = Air Movement and Controls Association ANSI = American National Standards Institute CAN/CSA = Canadian Standards Association CFM = Cubic Feet per Minute CFA = Conditioned Floor Area CFR = Code of Federal Regulations CPD = Certified Products Directory CZ = Climate Zone DOE = Department of Energy DUV = Dwelling Unit Ventilation ERI = Energy Rating Index ERV = Energy Recovery Ventilator HP = Horsepower HRV = Heat Recovery Ventilator HVI = Home Ventilating Institute ICC = International Code Council IECC = International Energy Conservation Code IESNA = Illuminating Engineering Society of North America IMC = International Mechanical Code IRC = International Residential Code NA = Not Applicable NMT = Net Moisture Transfer NR = Not Required Pa = Pascals VAV = Variable Air Volume WC = Water Column</p>
Design Load Adjustments C403.1.1	
<ul style="list-style-type: none"> ➤ Heating, cooling, and ventilating loads in accordance with ANSI/ASHRAE/ACCA 183 or approved equivalent ➤ Loads adjusted in accordance with ASHRAE HVAC Systems and Equipment Handbook by an approved equivalent when energy recovery is used in HVAC system. 	
Inspections and Compliance Documentation	
<p>C107.2.4 requires mechanical inspection which includes mechanical ventilation systems and ventilation performance such as fan efficacy and energy recovery</p>	<p>C105.2 lists mechanical systems, equipment, controls, fan HP, and fan controls as required details on construction documents</p>
<p>Ventilation systems are included in building commissioning required in C408 when applicable</p>	
<p><i>Note: IECC Defines Enthalpy Recovery Ratio as “change in the enthalpy of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a percentage.”</i></p>	
<p>Important Resources</p> <ul style="list-style-type: none"> ❖ HVI CPD https://www.hvi.org/hvi-certified-products-directory/ ❖ ASHRAE Standards Read-Only Versions 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 	