



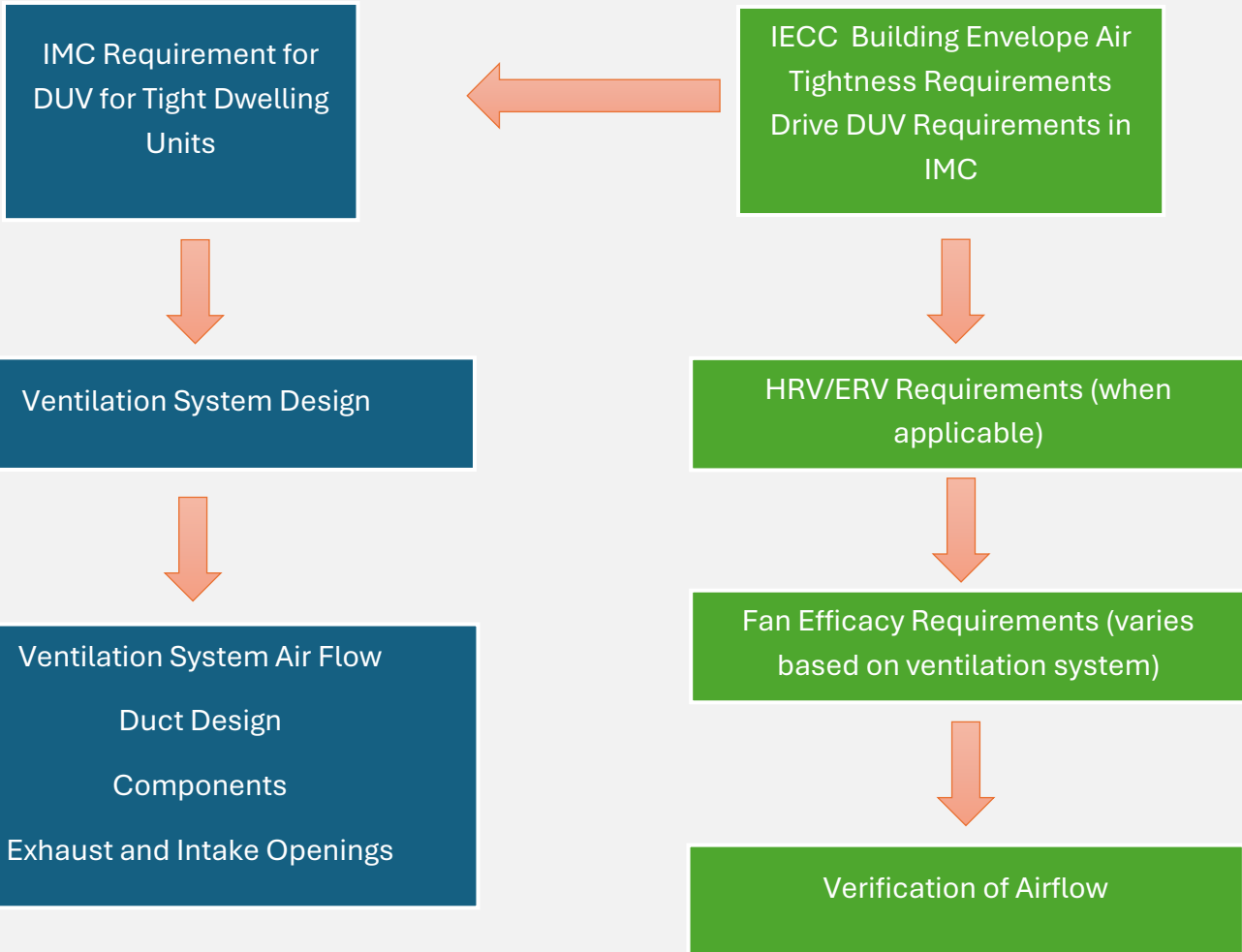
HRV/ERV Code Primer

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?	Dwelling Unit Enclosure Air Tightness (Blower Door) Testing Required?
YES IMC 401.2 dwelling units with leakage < 5 ACH50 tested in accordance with IECC R402.4.1.2 require DUV IMC 403.2 – Requires outdoor air	No Three Options: ➤ Air barrier constructed of tested materials (C402.5.1.2.1) ➤ Air barrier constructed of tested assemblies (C402.5.1.2.2) ➤ Tested whole building envelop air leakage ≤ 0.4 CFM/ft ² at 50 Pa pressure C402.5 Exceptions: CZ 2B

Note: IECC 2018 does not require building envelope air leakage testing of dwelling units in multifamily buildings 4 stories or higher. This means that IMC401.2 does not cover all dwelling units and specifically references IECC Residential provisions. Regardless of building height, dwelling units will need to provide outdoor air required by IMC 403.2

Note: Due to complication of testing large buildings, historically very few projects have opted for whole building testing as an air barrier compliance option.

Energy Recovery Ventilation Required for Some DUV Systems C403.7.4					
DUV Operating ≥ 8000 Hrs/Yr (Approximately Continuous Operation) Table C403.7.4(2)			DUV Designed to Operate < 8000 Hrs/Yr (Most Intermittent Operation Systems) Table C403.7.4(1)		
When DUV System provides ≥ 80% of Design Outdoor Air			When DUV System provides > 80% of Design Outdoor Air		
DUV System ≥ 40 CFM	Energy Recovery Required	CZ 4A, 5A, 6A, 6B, 7, 8	DUV System ≥ 80 CFM	Energy Recovery Required	CZ 7, 8
DUV System ≥ 80 CFM	Energy Recovery Required	CZ 1A, 2A, 3A, 4B, 5B	DUV System ≥ 120 CFM	Energy Recovery Required	CZ 1A, 2A, 3A, 4A, 5A, 6A
Example: 1500 Ft ² 3 bedroom apartment would require 70 CFM outdoor air. For CZ 4A a 75 CFM system supplying 100% design outdoor air would require Energy Recovery			Example: a 280 CFM system supplying 100% design outdoor air, and operating intermittently at 25% time, would require Energy Recovery in CZ 2A		

Note: For systems that provide less than 80% of Design Outdoor Air, see Table C403.7.4(2) for Energy Recovery Requirements. The trigger for Energy Recovery in many of these cases will be larger than the typical HRV/ERV serving as DUV for a dwelling unit.



Relevant exceptions for dwelling units:

Where site-recovered or site solar energy provides > 60% of outdoor heating energy

Heating energy recovery is exempted in CZ 1, 2

Cooling energy recovery is exempted in CZ 3C, 4C, 5B, 6B, 7, and 8

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>Class I motorized damper</p> <p>Air leakage ≤ 4CFM/Ft² of damper surface area @ 249 Pa</p> <p>Tested in accordance with AMCA 500D</p> <p>Labeled by an approved agency</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 1, 2, 3 ❖ Exhaust design capacity ≤ 300CFM <p>Air leakage tested at 249 Pa</p> <p>Air leakage ≤ 20CFM/Ft²; damper ≥ 24 in either dimension</p> <p>Air leakage ≤ 40CFM/Ft²; damper < 24 in either dimension</p> <p>Tested in accordance with AMCA 500D</p> <p>Labeled by an approved agency</p>
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Alternative Compliance Path Options

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

C407 Total Building Performance Compliance Option

(Energy cost simulation or alternatively site Btu; compares proposed design to a standard reference design)

DUV Requirements in Effect for This Option?	Does HRV or ERV Provide C407 Compliance Flexibility?
<p>YES</p> <p>Note: C403.7 is mandatory and required for this compliance path, meaning that any energy recovery requirement that applies to DUV would be in effect</p>	<p>NO</p> <p>Mechanical ventilation system reference = proposed system. No credit gained from additional efficiency</p> <p>Note: when the building or dwelling unit is modeled, the standard reference design automatically compares the proposed design against a building with the same ventilation system (efficiency, energy recovery, type, air flow, etc.). For this reason, having more efficient ventilation systems does not gain any flexibility in this path.</p>

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.

C406 Additional Efficiency Requirement for Prescriptive Compliance Option – dedicated ventilation system may get points when installed with specific heating and cooling system types. *Note: this is a narrow application and will not apply broadly.*
Note: Additional efficiency packages are likely to be amended during state/local adoption



Requirements that may apply depending on the fan/system	Fact Sheet Acronyms
<ul style="list-style-type: none"> ➤ C403.8.4 fractional HP motors <ul style="list-style-type: none"> ○ 1/12 HP ≥ fan motors ≥ 1 HP have minimum motor efficiency ≥ 70% rated in accordance with DOE 10 CFR 431 ➤ C403.6 requirements and exceptions for mechanical systems serving multiple zones. 	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 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 NA = Not Applicable NR = Not Required Pa = Pascals VAV = Variable Air Volume WC = Water Column
<p>Design Load Adjustments C403.1.1</p>	
<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. 	
<p>Inspections and Compliance Documentation</p>	
<p>C105.2.4 requires mechanical inspection which includes mechanical ventilation systems and ventilation performance such as fan efficacy and energy recovery</p>	
<p>C103.2 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>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 	