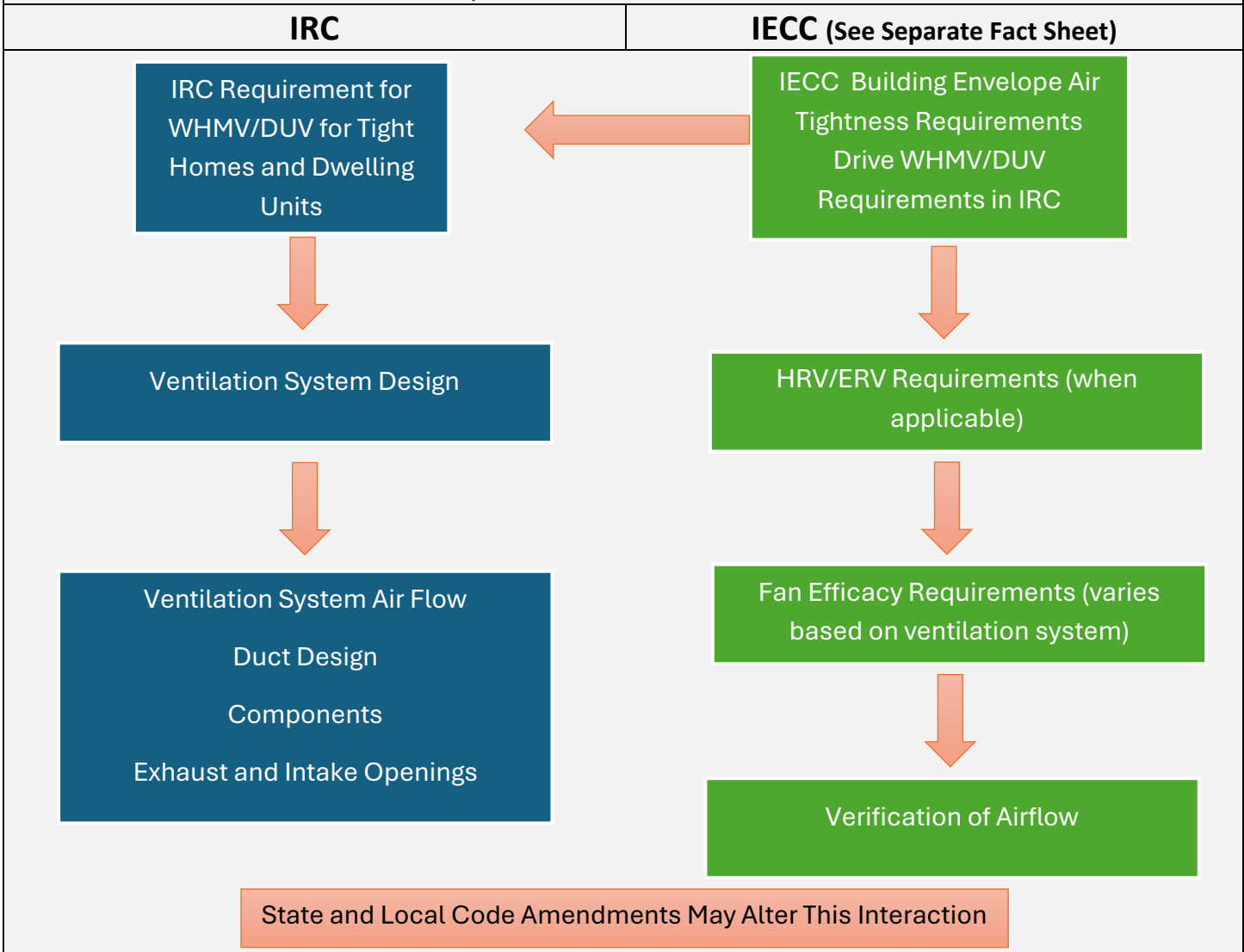




HRV/ERV Code Primer

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 system design and installation 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?	HRV/ERV Satisfies WHMV/DUV Requirements?
YES No prohibition of HRV/ERV in IRC	YES HRV/ERV satisfies requirements for WHMV/DUV. Specific requirements that apply to HRV/ERV are detailed in this fact sheet.
WHMV/DUV Required?	HRV or ERV Required?
YES IRC 325.3 – Homes meeting IECC air sealing requirements (IRC 1102.5.1/IECC 402.5.1) require WHMV/DUV	No Allowed/Not Required IRC M1505.4.1 (note: if adopted, IECC or IRC energy chapter 11 requires HRV or ERV for Climate Zones 6-8; advantage to HRV/ERV use in Additional Efficiency Package N1108.2.5 (IECC R408.2.5))
Note: IRC requirement for WHMV/DUV and IECC/IRC energy chapters for air sealing are often amended during state/local adoption Recommended Resource: IECC for requirements on ventilation system efficacy	

Specifying an HRV/ERV as WHMV/DUV

ASHRAE 62.2 Ventilation Rates Required?	WHMV/DUV Allowed System Types Include One or More of the Following:
No Generally, required CFM is lower in IRC. IRC also has less flexibility for advanced design considerations such as infiltration credits and particle filtration	<ul style="list-style-type: none"> ✓ Exhaust-only Ventilation System ✓ Supply-only Ventilation System ✓ Combination of Exhaust and Supply Fans Includes, but Not Limited to HRV/ERV

WHMV/DUV Ventilation Rates Flow Rates – Two Options:

Continuous Operation Option 1: IRC M1505.4.3, Equation 15-1: $CFM = (0.01 \times Ft^2 \text{ of Home}) + 7.5(\text{number of bedrooms} + 1)$

Continuous Operation Option 2: IRC Table M1505.4.3(1) Floor Area (Ft ²)	Number of Bedrooms				
	0-1	2-3	4-5	6-7	>7
<1500	30 CFM	45 CFM	60 CFM	75 CFM	90 CFM
1501-3000	45 CFM	60 CFM	75 CFM	90 CFM	105 CFM
3001-4500	60 CFM	75 CFM	90 CFM	105 CFM	120 CFM
4501-6000	75 CFM	90 CFM	105 CFM	120 CFM	135 CFM
6001-7500	90 CFM	105 CFM	120 CFM	135 CFM	150 CFM
>7500	105 CFM	120 CFM	135 CFM	150 CFM	165 CFM

Balanced Ventilation Credit 1504.3(1) Exception

30% Outside Air Reduction

- ✓ Balanced ventilation
- ✓ Direct supply to kitchen, living room, and dining room

Example: 75 CFM required unbalanced = 52.5 CFM required balanced

Intermittent Operation: Table M1505.4.3(2)

*Intermittent instructions: multiply continuous flow rate by factor
Example: 50% run time for 1000 Ft² 2 bedroom = 90 CFM*

Run Time Percentage	25%	33%	50%	66%	75%	100%
Factor	4	3	2	1.5	1.3	1.0

Note: Balanced ventilation credit allows HRV/ERV to downsize ventilation system compared to exhaust or supply only strategies
Recommended Resource: Find certified fan air flow ratings in the HVI CPD



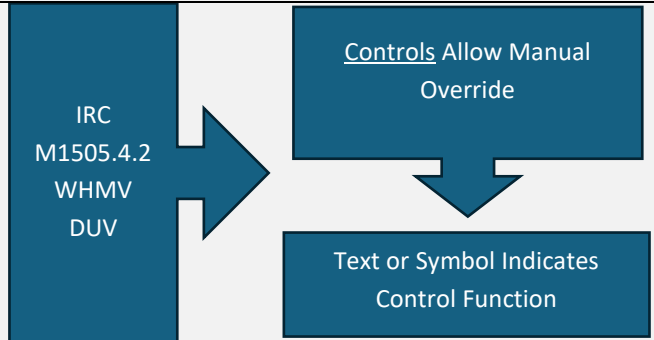
Local Exhaust Flow Rates Table M1505.5

Local Exhaust Rates	Bathroom	Kitchen
Continuous	20 CFM	25 CFM
Intermittent	50 CFM	100 CFM

Note: listed air flow at minimum static pressure 0.25" w.c. per M1505.3
Note: may be relevant to HRV/ERV tied to local exhaust such as bathroom exhaust ducted to HRV/ERV

M1505.3 exhaust and WHMV/DUV listed and labeled:
 ANSI/AMCA 210-ANSI/ASHRAE 51 or HVI 916
 Note: see HVI CPD for HVI 916 listing

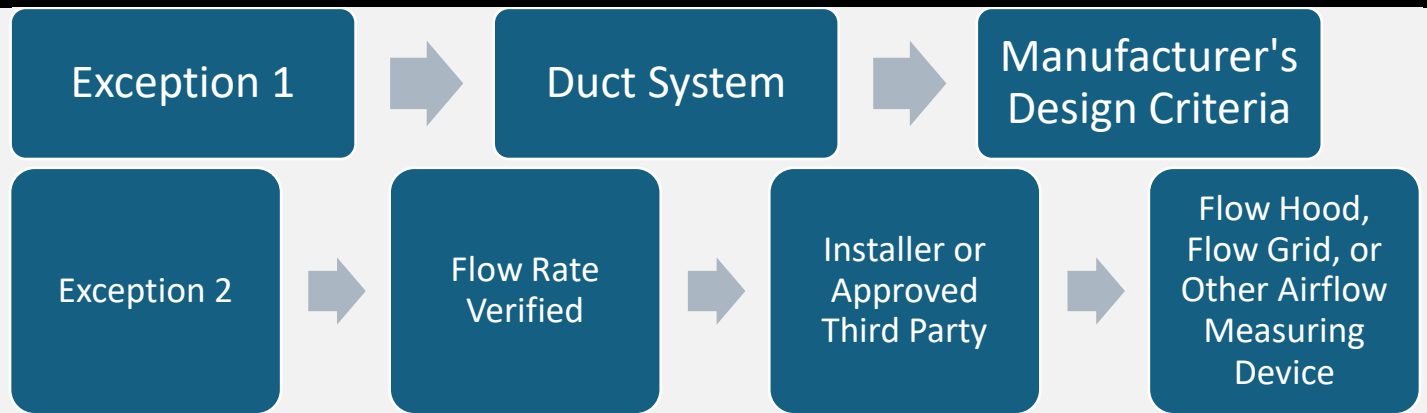
Controls for WHMV/DUV



Maximum Exhaust Duct Length Table M1504.2

Rated Airflow (CFM @ 0.25" WC)	Flex Duct								Smooth-Wall Duct							
	50	80	100	125	150	200	250	300	50	80	100	125	150	200	250	300
	Maximum Duct Length (feet)															
3" Diameter	X	X	X	X	X	X	X	X	5	X	X	X	X	X	X	X
4" Diameter	56	4	X	X	X	X	X	X	114	31	10	X	X	X	X	X
5" Diameter	NL	81	42	16	2	X	X	X	NL	152	91	51	28	4	X	X
6" Diameter	NL	NL	158	91	55	18	1	X	NL	NL	NL	168	112	53	25	9
7" Diameter	NL	NL	NL	NL	161	78	40	19	NL	NL	NL	NL	NL	148	88	54
8" or larger Diameter	NL	NL	NL	NL	NL	189	111	69	NL	NL	NL	NL	NL	NL	198	133

Note: for purposes of this table, X = duct of this diameter not allowed; NL = No Length Limit
Note: deduct 15 feet of allowable duct length for each duct elbow
Note: non-circular duct diameter = 4 x (cross sectional area) / perimeter



Note: while not explicitly listed, integrated diagnostic tools such as inline airflow measuring devices could be interpreted as an "other airflow measuring device" meeting exception 2. Be sure to check with AHJ for their interpretation.
 Note: Duct Length table specifically applies to exhaust ducts. For purposes of HRV/ERV these apply to exhaust duct portion of the system only.



Requirements for Ventilation System Components, Installation, and Design that Apply to HRV/ERV in Addition to Other Ventilation Systems

Exhaust Openings and Terminations (M1504.3; R325.4.2)		Intake Openings (mechanical and gravity) R325.4.1		Bathroom and toilet room exhaust M1505.2	
< 3 ft from property line		< 10 ft from any hazardous or noxious contaminant		Recirculated within residence	
< 3 ft from gravity air intake openings, operable windows, or doors		<i>Examples: vents, chimneys, plumbing vents, streets, alleys, parking lots, loading docks</i>		Recirculated to another dwelling unit	
< 3 ft from gravity air intake openings, operable windows and doors if exhaust opening ≥ 1ft above gravity air intake openings, operable windows, or doors		< 10 ft from contaminant source AND ≥ 3 ft below contaminant source		Bathroom, toilet room or kitchen exhaust M1505.2	
< 10 ft from mechanical air intake opening AND < 3 ft above air intake opening		Separation from Dryer Exhaust in accordance with M1502.3		Discharge into attic	
< 10 ft from mechanical air intake opening AND ≥ 3 ft above air intake opening		Separation from vents and chimneys serving fuel-burning appliances in accordance with chapter 18 and 24		Discharge into crawl spaces	
< 10 ft if factory-built combination intake/exhaust fitting installed per fan manufacturer's instructions AND exhaust air drawn from living space		<i>Note: R325.4.1 hazardous or noxious contaminants do not include dwelling unit toilet room, bathroom, or kitchen exhaust</i>		Discharge into other areas inside the building	
Directed onto walkways					

Protection for exhaust and intake openings terminating outdoors R303.6

- Corrosion-resistant screens, louvres or grilles
 - 1/4" (6mm) ≤ screen/louvre/grille openings ≤ 1/2" (13mm)
- Protected against local weather conditions
- Meet protective requirements of IRC for exterior wall openings

Note: for HRV/ERV in CZ 8 being used to comply with addition efficiency packages (IRC N1108.2.5/IECC R408.2.5) recirculating defrost is not permitted

Note: requirements for exhaust openings and terminations as well as intake openings are applicable to HRV/ERV exhaust and supply components. Bathroom, toilet room and kitchen exhaust information is included for situations in which HRV/ERV may be integrated with these ventilation systems

Recommended Resource: see HVI CPD for information on certified duct termination fittings, fresh air inlets, and static vents



Installation of Mechanical Appliances and Systems (Includes Ventilation)

Note: see code sections for details:

<p>Installation in flood hazard areas</p> <ul style="list-style-type: none"> ➤ M1301.1.1 ➤ R306.1.6 <p>Labeling requirements</p> <ul style="list-style-type: none"> ➤ M1303.1 ➤ M1303.1, Item 1 <p>Access requirements</p> <ul style="list-style-type: none"> ➤ M1305 <p>Clearance from combustible construction</p> <ul style="list-style-type: none"> ➤ M1306 	<p>General installation</p> <ul style="list-style-type: none"> ➤ M1307.1 <p>Anchorage requirements</p> <ul style="list-style-type: none"> ➤ M1307.2 <p>Specific requirements for electrical appliances</p> <ul style="list-style-type: none"> ➤ M1307.5 (points to chapters 14, 15, 19, 20, 34-43) <p>Gypsum board prohibited as support</p> <ul style="list-style-type: none"> ➤ M1307.7 <p>Drilling and notching requirements</p> <ul style="list-style-type: none"> ➤ M1308.1
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Inspections

R109.1.2 Rough-in inspection of ventilation systems (part of mechanical)

- Prior to covering/concealment
- Before appliance is set/installed
- Prior to framing inspection

R109.1.6 Final inspection (part of mechanical)

- After completion of work
- Prior to occupancy

R106.1.2 Manufacturers installation instruction (when required) available onsite during inspection.

Maintenance

1202.3 Mechanical systems shall be maintained

- Proper operating condition
- In accordance with original design
- Safe and sanitary condition
- Maintained in accordance with requirements of code edition under which system was installed.
- Owner is responsible
- Building department may require reinspection

Fact Sheet Acronyms

AHJ = Authority Having Jurisdiction
 ANSI = American National Standards Institute
 AMCA = Air Movement and Control Association
 ASHRAE = American Society of Heating, Refrigerating, and Air-Conditioning Engineers
 CFM = Cubic Feet per Minute
 CPD = Certified Products Directory
 CZ = Climate Zone
 DUV = Dwelling Unit Ventilation
 ERV = Energy Recovery Ventilator
 Ft = Feet
 HVI = Home Ventilating Institute
 HRV = Heat Recovery Ventilator
 ICC = International Code Council
 IECC = International Energy Conservation Code
 IMC = International Mechanical Code
 IRC = International Residential Code
 Mm = Millimeter
 W = Watt
 WC = Water Column
 WHMV = Whole House Mechanical Ventilation

Note on Important Change in 2021 IRC: M1504.3 provides allowances for factory-built combination intake/exhaust termination fittings, which will be helpful in adding flexibility to design, especially in small footprint homes and attached dwellings.

Be Aware: 2024 IRC has several reorganization changes that move sections relevant to HRVs and ERVs. For example, Section 303 for light, ventilation, and heating, has been moved to Section 325. Pay attention to new section numbers to find the current reference.

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 IRC
- ❖ 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