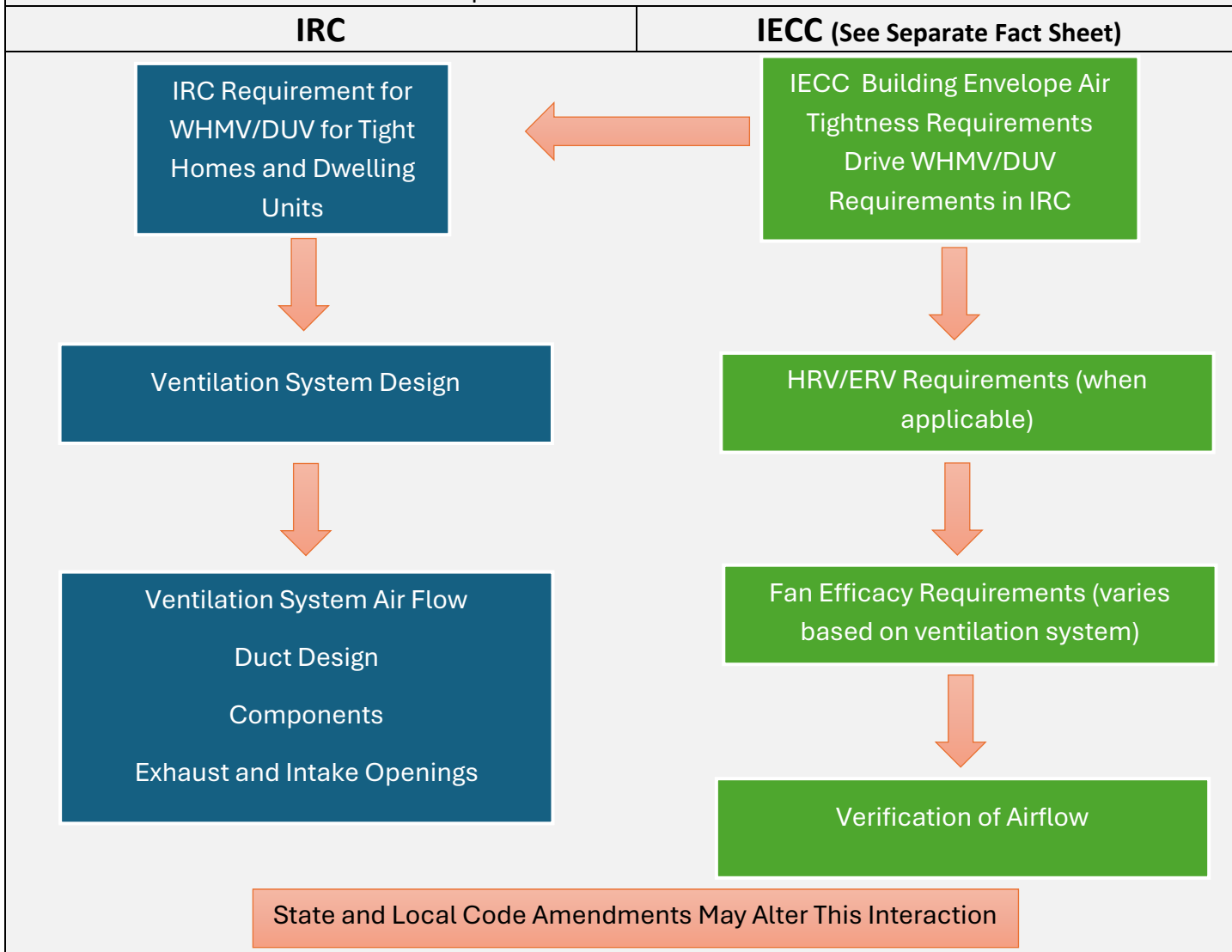




HRV/ERV Code Primer

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 303.4 – Homes meeting IECC air sealing requirements (IRC 1102.4.1/IECC 402.4.1) require WHMV/DUV	No Allowed/Not Required IRC M1505.4.1 <i>(note: if adopted, IECC or IRC energy chapter 11 requires HRV or ERV for Climate Zones 7 and 8; advantage to HRV/ERV use in Additional Efficiency Package N1108.2.5 (IECC R408.2.5))</i>

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)	Number of Bedrooms					
	Floor Area (Ft ²)	0-1	2-3	4-5	6-7	>7
<1500	30 CFM	45 CFM	60 CFM	75 CFM	90 CFM	90 CFM
1501-3000	45 CFM	60 CFM	75 CFM	90 CFM	105 CFM	105 CFM
3001-4500	60 CFM	75 CFM	90 CFM	105 CFM	120 CFM	120 CFM
4501-6000	75 CFM	90 CFM	105 CFM	120 CFM	135 CFM	135 CFM
6001-7500	90 CFM	105 CFM	120 CFM	135 CFM	150 CFM	150 CFM
>7500	105 CFM	120 CFM	135 CFM	150 CFM	165 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: While HVI listing is not required in the IRC (outside of the energy chapter copied from the IECC), find certified fan air flow ratings in the HVI CPD



Local Exhaust Flow Rates Table M1505.4.4

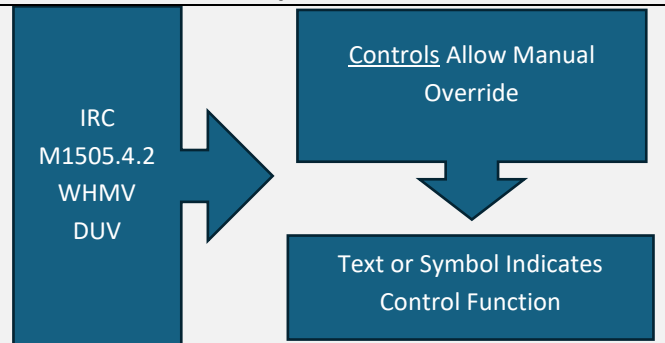
Local Exhaust Rates	Bathroom	Kitchen
Continuous	20 CFM	25 CFM
Intermittent	50 CFM	100 CFM

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.

Note: this standard is also referenced in HVI 916

Controls for WHMV/DUV



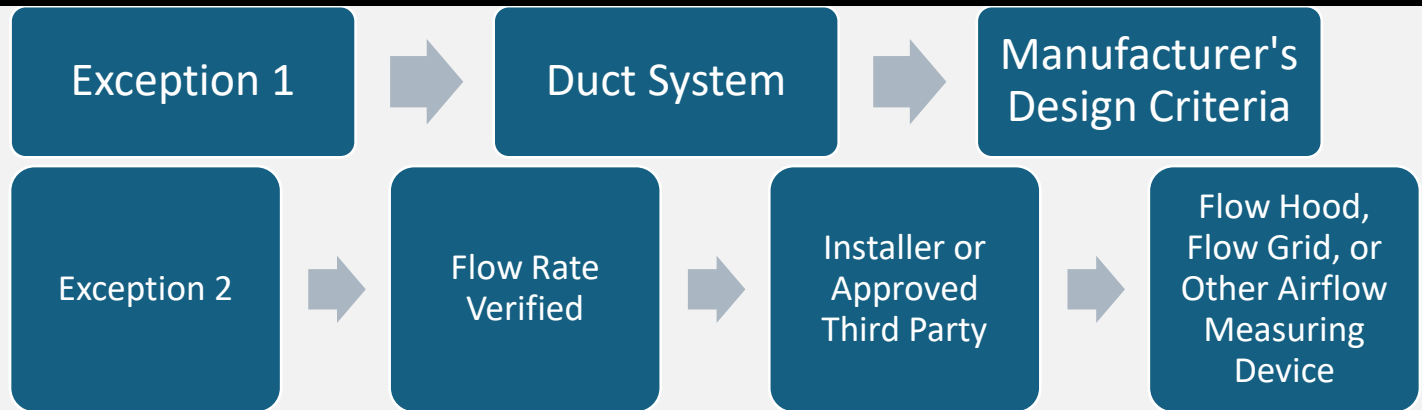
Maximum Exhaust Duct Length Table M1504.2

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; R303.5.2)		Intake Openings (mechanical and gravity) R303.5.1		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		Examples: vents, chimneys, plumbing vents, streets, alleys, parking lots, loading docks		Recirculated to another dwelling unit	
< 3 ft from operable windows and 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	
Directed onto walkways		Note: R303.5.1 hazardous or noxious contaminants do not include dwelling unit toilet room, bathroom, or kitchen exhaust		Discharge into other areas inside the building	

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 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:

Installation in flood hazard areas ➤ M1301.1.1 ➤ R322.1.6 Labeling requirements ➤ M1303.1 ➤ M1303.1, Item 1 Access requirements ➤ M1305 Clearance from combustible construction ➤ M1306	General installation ➤ M1307.1 Anchorage requirements ➤ M1307.2 Specific requirements for electrical appliances ➤ M1307.5 (Points to Chapters 14, 15, 19, 20, 34-43) Gypsum board prohibited as support ➤ M1307.7 Drilling and notching requirements ➤ M1308.1
--	---



Inspections	Fact Sheet Acronyms
<p>R109.1.2 Rough-in inspection of ventilation systems (part of mechanical)</p> <ul style="list-style-type: none"> ➤ Prior to covering/concealment ➤ Before appliance is set/installed ➤ Prior to framing inspection <p>R109.1.6 Final inspection (part of mechanical)</p> <ul style="list-style-type: none"> ➤ After completion of work ➤ Prior to occupancy <p>R106.1.2 Manufacturers installation instruction (when required) available onsite during inspection.</p>	<p>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 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 IRC = International Residential Code IMC = International Mechanical Code Mm = Millimeter W = Watt WC = Water Column WHMV = Whole House Mechanical Ventilation</p>
<p>Maintenance</p> <p>1202.3 Mechanical systems shall be maintained</p> <ul style="list-style-type: none"> ➤ 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 	<p><i>Note on Important Change in 2021 IRC: The 2021 IRC implemented a major change to the trigger for when dwelling units are required to have WHMV/DUV. Prior editions tied the requirement to a specific building air tightness test result. But, as many jurisdictions amended IECC air-tightness requirements, or removed air-tightness testing, homes were built without ventilation protections. The specific air-tightness provision also supported the misconception that indoor air quality hazards were tied to a specific air-tightness number, above which homes would be safe. This incorrect assessment could lead to a home being built to tight levels without needed mechanical ventilation. R303.4 was amended in the 2021 IRC to require any dwelling built to the air-tightness requirements of the IECC (or Chapter 11 of the IRC), with or without air-tightness testing, to include WHMV/DUV – eliminating many amendment problems, and correcting the above-described misconception.</i></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 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 	