



**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.

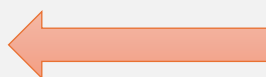
With this requirement established, the IRC provides specific requirements related to ventilation airflow, ducting, terminations, and components. The IECC provides specific requirements for energy recovery, fan efficacy, and air flow verification. This fact sheet provides guidance on how to find WHMV/DUV 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.

**IRC**

**IECC (See Separate Fact Sheet)**

IRC Requirement for WHMV/DUV for Tight Homes and Dwelling Units

IECC Building Envelope Air Tightness Requirements Drive WHMV/DUV Requirements in IRC



Ventilation System Design

HRV/ERV Requirements (when applicable)



Ventilation System Air Flow  
Duct Design  
Components  
Exhaust and Intake Openings

Fan Efficacy Requirements (varies based on ventilation system)



Verification of Airflow

State and Local Code Amendments May Alter This Interaction



<b>HRV/ERV Allowed?</b>	<b>HRV/ERV Satisfies WHMV/DUV Requirements?</b>
<b>YES</b> No prohibition of HRV/ERV in IRC	<b>YES</b> HRV/ERV satisfies requirements for WHMV/DUV. Specific requirements that apply to HRV/ERV are detailed in this fact sheet.
<b>WHMV/DUV Required?</b>	<b>HRV or ERV Required?</b>
<b>YES</b> IRC 303.4 – when building envelope air leakage $\leq$ 5ACH50 WHMV/DUV required  Note: this would be all homes where IRC chapter 11 or IECC is adopted unamended	<b>No</b> Allowed/Not Required. IRC M1505.4.1

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

<b>ASHRAE 62.2 Ventilation Rates Required?</b>	<b>WHMV/DUV Allowed System Types Include One or More of the Following:</b>
<b>No</b> 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"> <li>✓ Exhaust-only Ventilation System</li> <li>✓ Supply-only Ventilation System</li> <li>✓ Combination of Exhaust and Supply Fans</li> </ul> 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				
	0-1	2-3	4-5	6-7	>7
Floor Area (Ft <sup>2</sup> )					
<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

### Intermittent Operation: Table M1505.4.3(2)

*Intermittent Instructions: multiply continuous flow rate by factor*  
*Example: 50% run time for 1000 Ft<sup>2</sup> 2 bedroom = 90 CFM*

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

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**

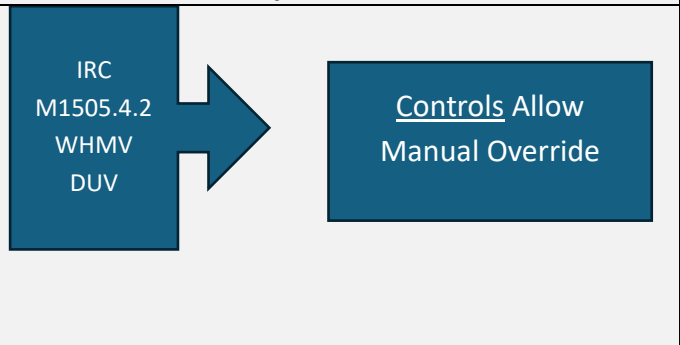
Local Exhaust Rates	Bathroom	Kitchen
Continuous	20 CFM	25 CFM
Intermittent	50 CFM	100 CFM

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**



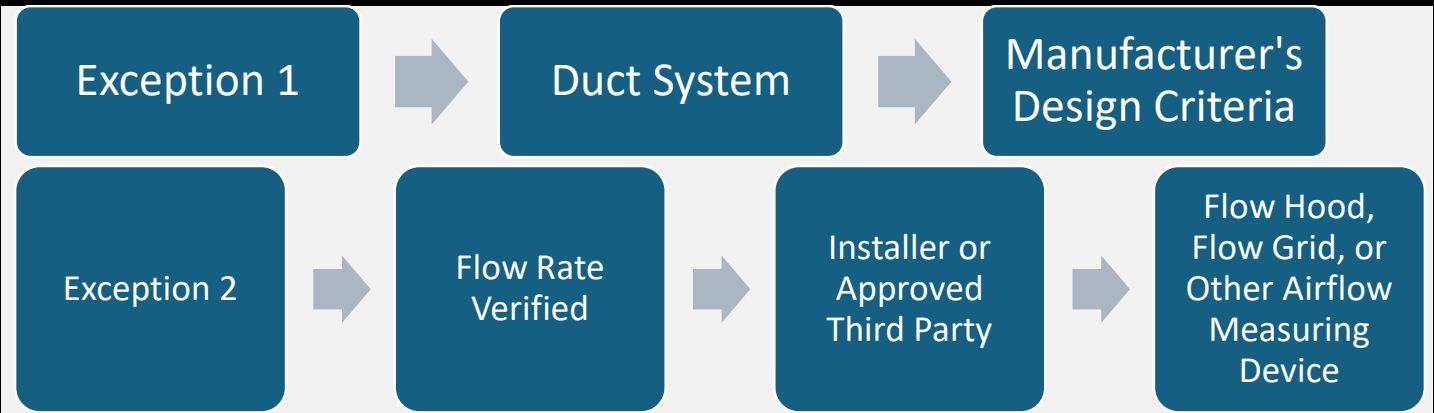
**Maximum Exhaust Duct Length Table M1504.2**

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		<i>Examples: vents, chimneys, plumbing vents, streets, alleys, parking lots, loading docks</i>		Recirculated to another dwelling unit	
< 3 ft from operable windows and doors		< 10 ft from contaminant source AND ≥ 3 ft below contaminant source		<b>Bathroom, toilet room or kitchen exhaust M1505.2</b>	
< 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		<i>Note: R303.5.1 hazardous or noxious contaminants do not include dwelling unit toilet room, bathroom, or kitchen exhaust</i>		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: 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) Drilling and notching requirements ➤ M1308.1
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Inspections	Fact Sheet Acronyms
<p>R109.1.2 Rough-in inspection of ventilation systems (part of mechanical)</p> <ul style="list-style-type: none"> <li>➤ Prior to covering/concealment</li> <li>➤ Before appliance is set/installed</li> <li>➤ Prior to framing inspection</li> </ul> <p>R109.1.6 Final Inspection (part of mechanical)</p> <ul style="list-style-type: none"> <li>➤ After completion of work</li> <li>➤ Prior to occupancy</li> </ul> <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><b>Maintenance</b></p> <p>1202.3 Mechanical systems shall be maintained</p> <ul style="list-style-type: none"> <li>➤ Proper operating condition</li> <li>➤ In accordance with original design</li> <li>➤ Safe and sanitary condition</li> <li>➤ Maintained in accordance with requirements of code edition under which system was installed.</li> <li>➤ Owner is responsible</li> <li>➤ Building department may require reinspection</li> </ul>	<p><i>Note on Important Change in 2018 IRC: Section M1505 contains many of the same requirements for mechanical ventilation found in section M1507 in earlier editions of the code. Users used to an earlier edition will have to look for the information in M1505. Also, Equation 15-1 was first introduced as a method for calculating the required outdoor air flow rate for WHMV/DUV. In prior editions, only the prescriptive table was allowed.</i></p>
<p>Important Resources</p> <ul style="list-style-type: none"> <li>❖ HVI CPD <a href="https://www.hvi.org/hvi-certified-products-directory/">https://www.hvi.org/hvi-certified-products-directory/</a></li> <li>❖ ASHRAE Read-Only Standards <a href="https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards">https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards</a></li> <li>❖ ICC Codes <a href="https://codes.iccsafe.org/">https://codes.iccsafe.org/</a> for actual code text and other codes referenced throughout IRC</li> <li>❖ 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</li> </ul>	