Energy Recovery Preconditioners Cross Reference

Models MiniVent, ERV, ERVe, MiniCore, ECV

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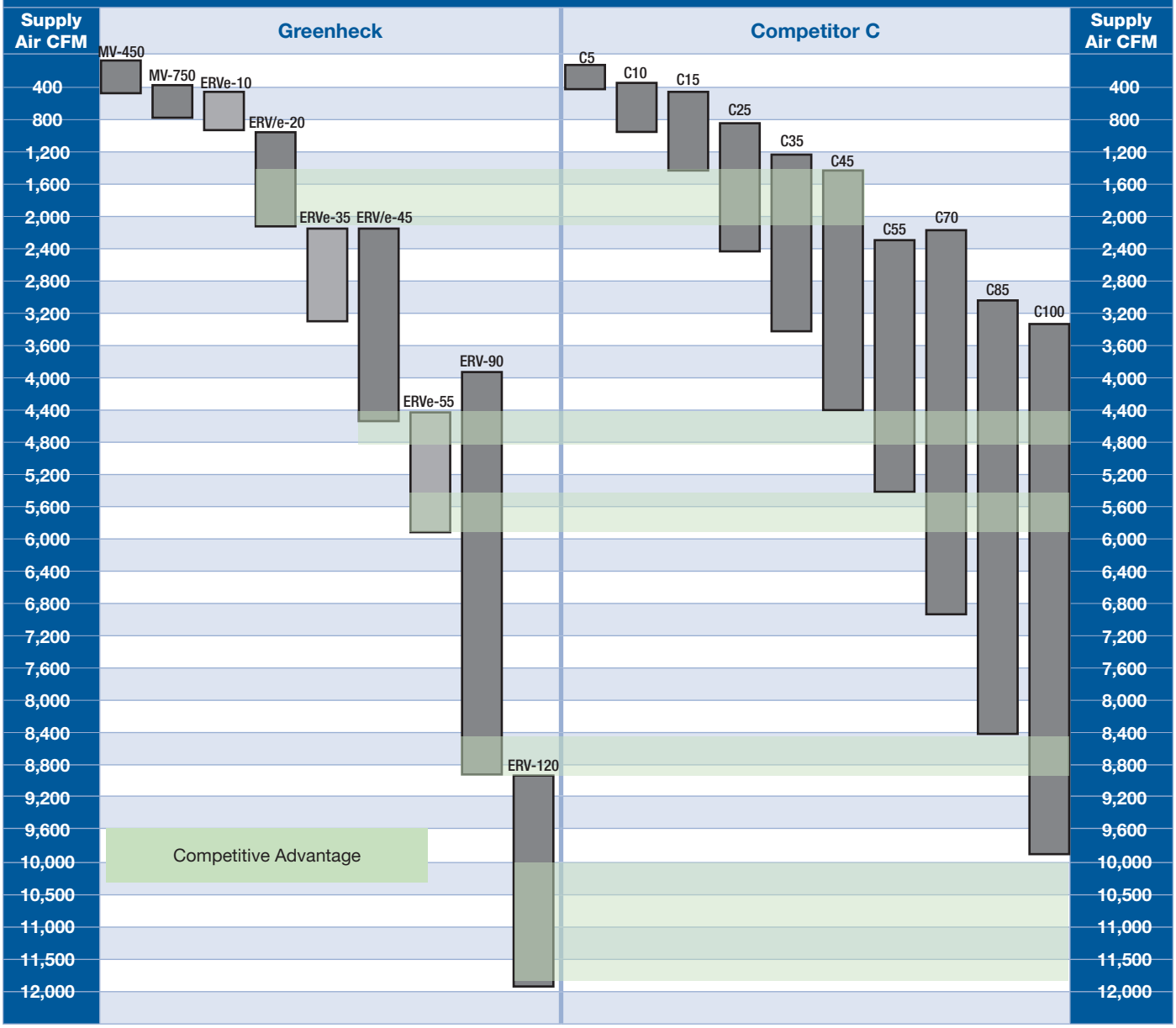
GREENHECK®
Building Value in Air.

December 2020

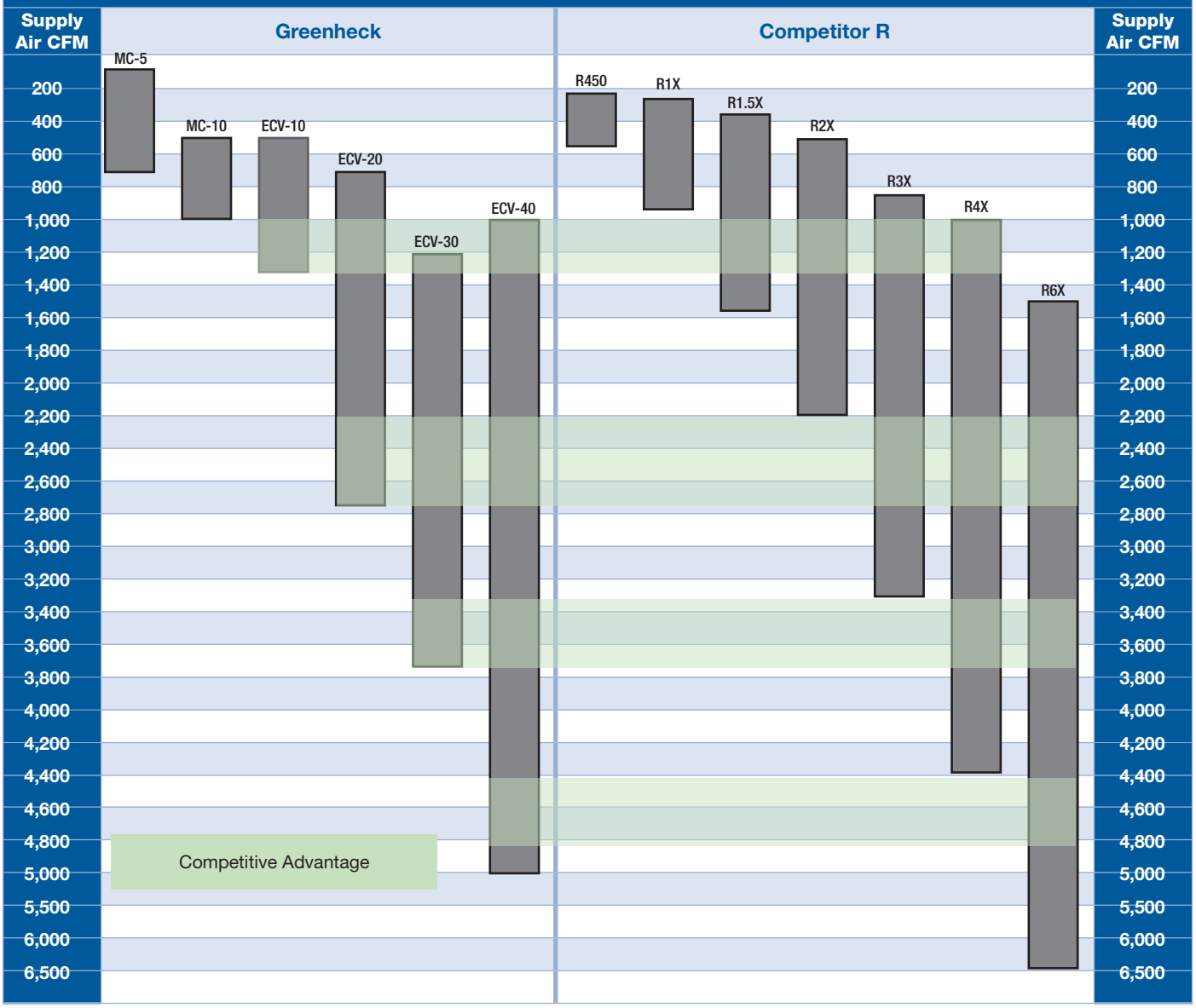
MiniVent and ERV/ERVe Model Comparison



Models		MiniVent		ERV					ERVe			
Cabinets		450	750	10	20	45	90	120	20	35	45	55
Inches	Length	37.6	43.2	46.2	62.0	67.0	124.4	146.1	65.9	68.1	72.1	83.0
	Base Width	26.4	33.0	33.8	51.1	67.1	84.1	96.5	454.1	53.2	60.2	70.2
	Height	19.9	23.8	28.0	34.4	44.7	66.3	76.4	52.6	62.6	68.9	75.4
CFM	Min CFM	150	450	500	1000	2200	4000	9000	1000	2200	3400	4500
	Max CFM	500	850	1000	2000	4500	9000	12000	2200	3400	4500	6000

Models		Competitor C									
Cabinets		500	1000	1500	2500	3500	4500	5500	7000	7500	10000
Inches	Length	23.8	28.8	42.9	52.4	59.0	64.5	71.0	76.5	83.0	90.0
	Base Width	22.0	28.3	49.3	52.0	60.5	66.5	66.5	80.0	80.0	84.5
	Height	50.1	50.1	54.3	52.0	64.5	69.5	69.5	79.5	79.5	100.0
CFM	Min CFM	200	400	500	900	1300	1500	2350	2250	3100	3400
	Max CFM	500	1000	1500	2500	3500	4500	5500	7000	8500	10000

MiniCore and ECV Model Comparison



Indoor Mounted

		MiniCore		ECV				Competitor R											
Models																			
Cabinets		5	10	10	20	30	40	450	1X		1.5X		2X		3X		4X		6X
Orientation		H						H	V	H	V	H	V	H	V	H	V	H	H
Inches	Length	47.3	47.3	54.8	60.0	60.0	60.0	54.5	40.5	54.8	59.5	48.8	50.5	64.3	50.8	72.5	50.8	72.8	88.0
	Base Width	16.3	21.5	28.9	43.8	61.3	81.0	16.4	23.8	23.8	34.5	34.5	42.0	43.0	61.5	63.3	81.5	82.8	113.5
	Height	39.4	39.4	43.9	44.9	44.9	44.9	36.0	50.8	35.8	46.3	53.8	52.5	35.5	62.0	44.0	62.0	44.0	81.8
CFM	Min CFM	150	500	500	750	1200	1600	200	250		375		500		750		1000		1500
	Max CFM	700	1000	1300	2750	3750	5000	540	925		1575		2200		3300		4400		6500

Outdoor Mounted

		ECV				Competitor R						
Models												
Cabinets		10	20	30	40	450	1X	1.5X	2X	3X	4X	6X
Inches	Length	54.8	60.0	60.0	60.0	75.0	81.0	86.0	87.5	94.0	98.0	106.5
	Base Width	28.9	43.8	61.3	81.0	36.5	40.3	33.3	43.3	63.0	83	113.5
	Height	43.9	44.9	44.9	44.9	19.3	44	56.8	44	44	44	81.8

Specifying Strategies

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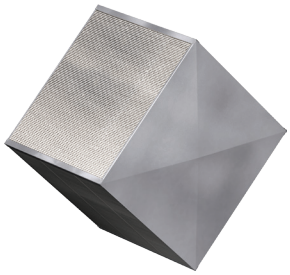
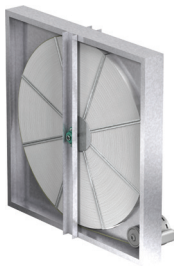
MiniVent	ERV ERVe	Specifying Strategies
✓	✓	Schedule minimum enthalpy recovery ratio value. Required to comply with ASHRAE 90.1 Exhaust Air Energy Recovery 6.5.6.1. Enthalpy effectiveness must be on the schedule to ensure that engineers will hold to scheduled performance.
✓	✓	Schedule energy wheel leaving air temperatures (F) for cooling (summer) and heating (winter) to ensure that engineers will hold to scheduled performance.
	✓	Avoid adding the remote display when a building management system (BMS) is used because the BMS can monitor the unit. The remote display is ideal if a BMS is not available and provides a way to view those status points.
✓	✓	Specify that energy recovery wheel bear the AHRI 1060 certified product seal.
	✓	Specify that the unit shall incorporate a stand-alone DDC controller with an integral LCD screen.
✓	✓	Specify that energy wheels greater than 25-inch in diameter must be provided with removeable segments. Competitor C does not use a segmented wheel.
✓	✓	Specify that the energy wheel desiccant be permanently bonded to the energy transfer media without the use of binders or adhesives.
	✓	Specify that energy wheels greater than 25” in diameter must be provided with removeable segments. Competitor C does not use a segmented wheel.

MiniCore	ECV	Specifying Strategies
✓	✓	Schedule minimum enthalpy recovery ratio value. Required to comply with ASHRAE 90.1 Exhaust Air Energy Recovery 6.5.6.1. Enthalpy effectiveness must be on the schedule to ensure that engineers will hold to scheduled performance. Competitor R lists an AHRI 1060 Effectiveness.
✓	✓	Schedule energy core leaving air temperatures (F) for cooling (summer) and heating (winter) to ensure that engineers will hold to scheduled performance.
✓	✓	Specify that the energy core bear the AHRI 1060 certified product seal.
	✓	Specify that the unit shall incorporate a stand-alone DDC controller with an integral LCD screen.
	✓	Specify that the polymer membrane core not degrade or promote the growth of mold and bacteria with a rating of 0 in accordance with ISO846 A and C.
✓	✓	Specify that the energy core be flameproof and comply with UL 723 with a flame spread index that shall not exceed 25 and a smoke index that shall not exceed 50.
	✓	Avoid adding the remote display when a building management system (BMS) is used because the BMS can monitor the unit. The remote display is ideal if a BMS is not available and provides a way to view those status points.
✓	✓	If equipment schedule calls out 460/3 power, select the unit as 277/1.
	✓	Specify an internal bypass damper. Competitor R requires an external bypass damper (field installed).
	✓	Specify direct drive mixed flow plenum fans (ECV-20, 30, and 40 only). Competitor R uses belt-driven, forward-curved blowers which, are less efficient and require larger motors (HP).
	✓	Specify a polymer membrane energy recovery core. Competitor R does not offer a polymer energy recovery core.
	✓	Specify a washable energy recovery core when selecting a polymer membrane (-PM) model. Competitor R’s energy recovery core is vacuum clean only.
	✓	Outdoor/exhaust air is between 1100 and 1300 cfm for ECV-10-PM. Competitor R has to use a housing 2X.
	✓	Outdoor/exhaust air is between 2200 and 2700 cfm for ECV-20-PM. Competitor R has to use a housing 3X.
	✓	Outdoor/exhaust air is between 3300 and 3700 cfm for ECV-30-PM. Competitor R has to use a housing 4X.
	✓	Outdoor/exhaust air is between 4400 and 5000 cfm for ECV-40-PM. Competitor R has to use a housing 6X.

Energy Recovery Technology

Fiber Membrane (-FM) Energy Core	Polymer Membrane (-PM) Energy Core	Polymer Energy Wheel
		
MiniCore and ECV	ECV Only	ERV and ERVe
Vacuum Cleanable	Washable	
Airflows up to 4,400 cfm	Airflows up to 5,000 cfm	Airflows up to 12,000 cfm
Economic Offering	Reduced pressure drop, Higher ERR	Highest ERR
No moving parts		Segmented construction
0-1% Exhaust Air Transfer Ratio (EATR)		3-5% EATR
Sensible (heat) & latent (moisture) energy transfer		

ASHRAE 62.1 Redesignation

ASHRAE 62.1 section 5.16.2, provides clear-cut parameters for allowable cross-leakage/exhaust air transfer ratio (EATR) for energy recovery ventilators. Air is classified with respect to contaminant and odor intensity and have been defined as follows:

- **Class 1:** Air with low contaminant concentration and inoffensive odor and sensory-irritation intensity, suitable for recirculation or transfer to any space.
- **Class 2:** Air with moderate contaminant concentration, mildly offensive odors or sensory-irritation intensity, suitable for recirculation or transfer to any space with Class 2 or Class 3 or that is utilized for the same or similar purpose and involves the same or similar pollutant sources. Class 2 air is not suitable for recirculation or transfer to spaces with Class 1 air, or dissimilar spaces with Class 2 or Class 3 air.
- **Class 3**: Air with significant contaminant concentration or significant offensive odor or sensory-irritation intensity that is suitable for recirculation with the same space. Class 3 air is not suitable for recirculation or transfer to any other space.
- **Class 4:** Air with highly objectionable fumes or gases or potentially containing dangerous particles, bioaerosols, or gases at a concentration high enough to be considered harmful, not suitable for recirculation or transfer to any other space.

Recommended Cleaning Frequency

Creating a regular cleaning schedule is critical to maintaining the performance of the energy recovery device. The schedule should be based upon particles present in the exhaust airstream, operating hours, and climate. The table below provides a best practice guideline for determining the appropriate cleaning schedule for several applications:

Class of Air	Application Examples	Cleaning Frequency
Class 1	Office space, classroom, church	Every 1-2 years
Class 2	Rest room, beauty salon, locker room	Every 1 year
Class 3	Dry cleaners, pet shops	Every 6 months
Class 4	Lab fume exhaust, kitchens, paint spray booths	N/A

Understanding ASHRAE Standard 90.1

Air-to-air energy recovery devices present several key benefits for commercial buildings. These benefits include a reduction in the overall mechanical cooling and heating requirements, lower energy consumption due to reduced mechanical equipment sizes, and less variability in air conditions entering the cooling and heating system. Because energy recovery devices have shown a significant savings in energy consumption, energy standards for commercial buildings have included requirements for air-to-air energy recovery based on system design. ASHRAE Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings", defines guidelines for energy efficiency in commercial buildings.

ASHRAE 90.1-2007

This version of the standard states an energy recovery device is required if:

1. **The supply air volume is ≥ 5,000 cfm**
2. **AND 70% or more of the supply air volume is outdoor air.**

The energy recovery system shall also have a total effectiveness ≥ to 50%.

ASHRAE 90.1-2010

While ASHRAE 90.1-2007 drives the use of energy recovery based on airflow and outdoor air percentage, it does not differentiate the use based on geographic locations and climate, both of which can heavily influence the benefits of energy recovery. ASHRAE 90.1-2010 expands the requirements of energy recovery use by separating the United States into different climate zones based on historical weather conditions. *(Reference ASHRAE Standard 169 for climate zone map.)*

The energy recovery system shall also have a total effectiveness ≥ to 50%.

ASHRAE 90.1 2010 Standard Energy Recovery Requirement						
Zone	Percentage of Outdoor Air at Full Design Airflow Rate (cfm)					
	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	≥ 80%
	Design Supply Fan Airflow Rate (cfm)					
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	≥ 5,000	≥ 5,000
1B, 2B, 5C	NR	NR	≥ 26,000	≥ 12,000	≥ 5,000	≥ 4,000
6B	≥ 11,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,500	≥ 1,500
1A, 2A, 3A, 4A, 5A, 6A	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,000	≥ 1,000	≥ 0
7, 8	≥ 2,500	≥ 1,000	≥ 0	≥ 0	≥ 0	≥ 0

NR = Not required

ASHRAE 90.1-2013

When energy recovery is applied to systems in operation for extensive periods of time, such as 24-hour operation, 7 days a week, significant energy savings can be realized. Because of this, the ASHRAE 90.1-2013 standard takes operating hours into account when defining energy recovery requirements.

The energy recovery system shall also have an enthalpy recovery ratio (ERR) ≥ to 50%.

ASHRAE 90.1 2013 Standard For Energy Recovery Requirement Based On Operating Hours Per Year								
Ventilation Systems Operating Less Than 8,000 Hours Per Year								
Zone	Percentage of Outdoor Air at Full Design Airflow Rate (cfm)							
	10% ≤ 20%	20% ≤ 30%	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	≥ 80%
	Design Supply Fan Airflow Rate (cfm)							
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	NR	NR	NR	NR
1B, 2B, 5C	NR	NR	NR	NR	≥ 26,000	≥ 12,000	≥ 5,000	≥ 4,000
6B	≥ 28,000	≥ 26,500	≥ 11,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,500	≥ 1,500
1A, 2A, 3A, 4A, 5A, 6A	≥ 26,000	≥ 16,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,000	≥ 1,000	≥ 0
7, 8	≥ 4,500	≥ 4,000	≥ 2,500	≥ 1,000	≥ 0	≥ 0	≥ 0	≥ 0

NR = Not required

ASHRAE 90.1-2013 Continued

ASHRAE 90.1 2013 Standard For Energy Recovery Requirement Based On Operating Hours Per Year								
Ventilation Systems Operating Greater Than or Equal To 8,000 Hours Per Year								
Zone	Percentage of Outdoor Air at Full Design Airflow Rate (cfm)							
	10% ≤ 20%	20% ≤ 30%	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	≥ 80%
	Design Supply Fan Airflow Rate (cfm)							
3C	NR	NR	NR	NR	NR	NR	NR	NR
1B, 2B, 3B, 4C, 5C	NR	≥ 19,500	≥ 9,000	≥ 5,000	≥ 4,000	≥ 3,000	≥ 1,500	≥ 0
1A, 2A, 3A, 4B, 5B	≥ 2,500	≥ 2,000	≥ 1,000	≥ 500	≥ 0	≥ 0	≥ 0	≥ 0
4A, 5A, 6A, 6B, 7, 8	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0	≥ 0

NR = Not required

ASHRAE 90.1-2016/2019

This version of the standard is very similar to ASHRAE 90.1-2013 however, certain climate zone requirements have changed. The minimum supply fan airflow rate was increased from 0 cfm to an amount based on equipment sizes that are readily available. This change reduces the requirement for energy recovery in climates where smaller ERVs are not available.

The energy recovery system shall also have an enthalpy recovery ratio (ERR) ≥ to 50%.

ASHRAE 90.1 2016/2019 Standard For Energy Recovery Requirement Based On Operating Hours Per Year								
Ventilation Systems Operating Less Than 8,000 Hours Per Year								
Zone	Percentage of Outdoor Air at Full Design Airflow Rate (cfm)							
	10% ≤ 20%	20% ≤ 30%	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	≥ 80%
	Design Supply Fan Airflow Rate (cfm)							
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	NR	NR	NR	NR
0B, 1B, 2B, 5C	NR	NR	NR	NR	≥ 26,000	≥ 12,000	≥ 5,000	≥ 4,000
6B	≥ 28,000	≥ 26,500	≥ 11,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,500	≥ 1,500
0A, 1A, 2A, 3A, 4A, 5A, 6A	≥ 26,000	≥ 16,000	≥ 5,500	≥ 4,500	≥ 3,500	≥ 2,000	≥ 1,000	≥ 120
7, 8	≥ 4,500	≥ 4,000	≥ 2,500	≥ 1,000	≥ 140	≥ 120	≥ 100	≥ 80

NR = Not required

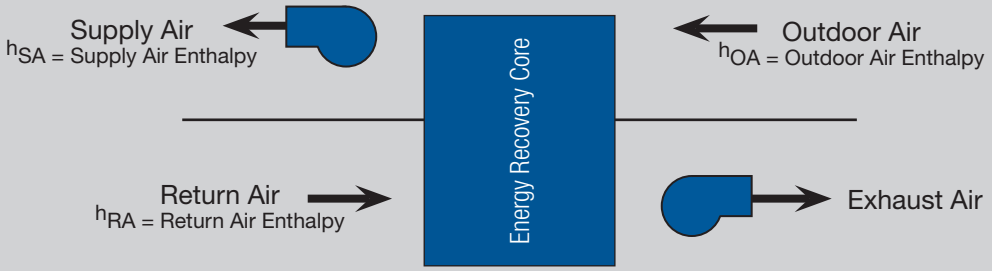
ASHRAE 90.1 2016/2019 Standard For Energy Recovery Requirement Based On Operating Hours Per Year								
Ventilation Systems Operating Greater Than or Equal To 8,000 Hours Per Year								
Zone	Percentage of Outdoor Air at Full Design Airflow Rate (cfm)							
	10% ≤ 20%	20% ≤ 30%	30% ≤ 40%	40% ≤ 50%	50% ≤ 60%	60% ≤ 70%	70% ≤ 80%	≥ 80%
	Design Supply Fan Airflow Rate (cfm)							
3C	NR	NR	NR	NR	NR	NR	NR	NR
0B, 1B, 2B, 3B, 4C, 5C	NR	≥ 19,500	≥ 9,000	≥ 5,000	≥ 4,000	≥ 3,000	≥ 1,500	≥ 120
0A, 1A, 2A, 3A, 4B, 5B	≥ 2,500	≥ 2,000	≥ 1,000	≥ 500	≥ 140	≥ 120	≥ 100	≥ 80
4A, 5A, 6A, 6B, 7, 8	≥ 200	≥ 130	≥ 100	≥ 80	≥ 70	≥ 60	≥ 40	≥ 40

NR = Not required

What Does Enthalpy Recovery Ratio (ERR) Mean?

The enthalpy recovery ratio must be greater than or equal to 50%, as defined by ASHRAE Standard 90.1. This is the difference in the enthalpy of the outdoor air equal to 50% or greater of the difference between the outdoor air and return enthalpies at design conditions.

$$\text{Enthalpy Recovery Ratio} = \frac{h_{OA} - h_{SA}}{h_{OA} - h_{RA}} \geq 0.50$$



Selection Guide

		MV	ERV	ERVe	MC	ECV	ERM
ER Technology	Polymer Wheel	✓	✓	✓			✓
	Fiber Membrane Core				✓	✓	
	Polymer Membrane Core					✓	
Mounting	Indoor	✓	✓	✓	✓	✓	✓
	Outdoor		✓	✓		✓	
Performance	Min Volume (cfm)	150	500	1,000	150	500	600
	Max Volume (cfm)	850	12,000	6,000	1,000	5,000	10,000
Control Options	Microprocessor		✓	✓		✓	
	BMS Integration		✓	✓		✓	
	Frost Control	✓	✓	✓	✓	✓	
	Economizer		✓	✓		✓	
	Vari-Green® Motors	✓	✓		✓	✓	
	Fan VFDs		✓	✓		✓	
	Motorized Dampers		✓	✓		✓	
Certifications	UL Certified	✓	✓	✓	✓	✓	✓
	AHRI 1060 Certified	✓	✓	✓	✓	✓	✓