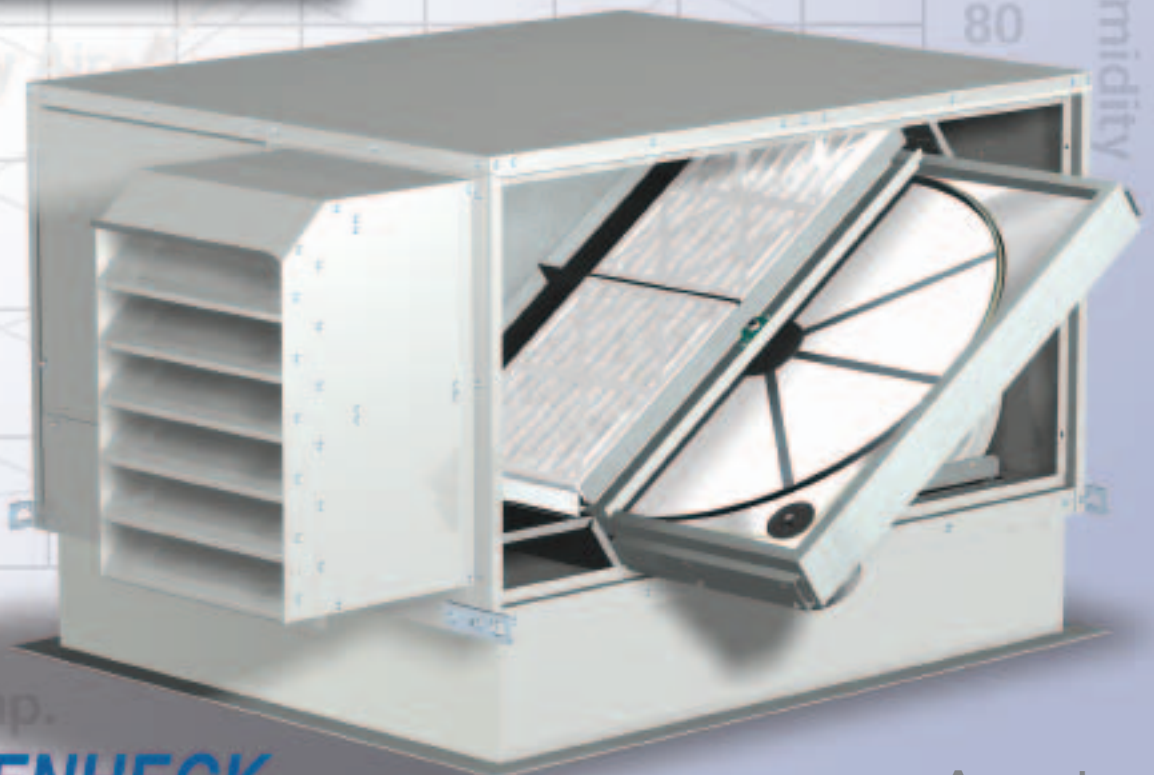


Energy Recovery Ventilator Model ERV

- Commercial
- Institutional

- 400 to 12,000 cfm
- 1.5 in. wg external static pressure



ENERGY RECOVERY VENTILATOR



VENTILATE ADEQUATELY AND ECONOMICALLY

To provide a healthy and productive indoor environment, adequate ventilation is necessary. ASHRAE Standard 62, Ventilation for Acceptable Indoor Air Quality, prescribes ventilation requirements. However, providing adequate ventilation AND controlling energy costs may appear to be mutually exclusive objectives. Greenheck recognized this dilemma and accepted the challenge of developing ventilation equipment that enables an HVAC system to meet both objectives.

The result is the Greenheck Energy Recovery Ventilator, which allows the HVAC system to meet the Standard 62 ventilation rates while controlling energy costs and humidity levels. This product line offers the system designer an economical solution to many Indoor Air Quality problems. In many markets payback is less than one year. Additionally, Greenheck's energy recovery ventilators are easy to apply in new construction or renovation installations.

IDEAL FOR:


- Schools
- Office Buildings
- Nursing Homes
- Retail Stores
- Restaurants
- Hotels

Energy Recovery Technology

Greenheck has combined its expertise in ventilation products with the latest technology in air-to-air heat exchangers. The heart of the energy recovery ventilator is a light-weight polymer enthalpy wheel. Silica gel desiccant is permanently bonded to the polymer, which provides a long and reliable energy transfer life. This state of the art wheel design has low pressure drop characteristics that enable the ventilator to accommodate external static pressure requirements up to 1.50 in. wg. Also, in contrast to heat wheels of the 1970's, Greenheck's wheels were designed specifically for commercial and institutional installations with minimal maintenance in mind. For comfort ventilation applications up to 12,000 cfm, it is the best all around total energy recovery device available.



Energy recovery wheels certified by the ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with ARI Standard 1060. Actual performance in packaged equipment may vary. Certified Ratings are available in the Certified Product Directory at <http://www.ari.org/directories/erv>



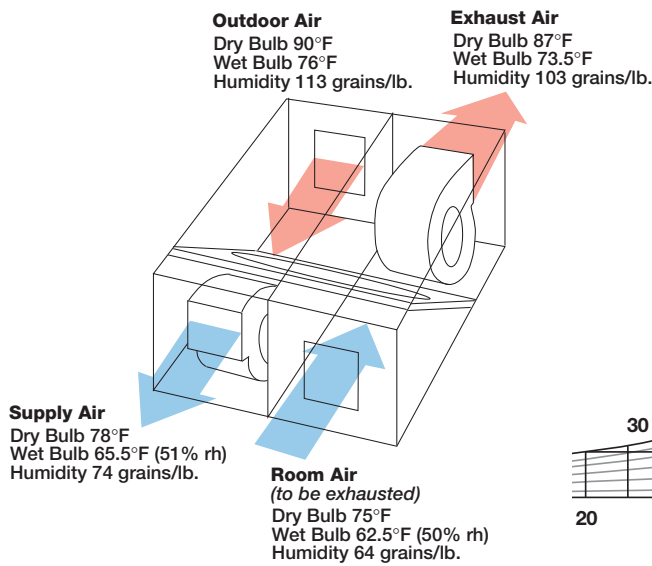
Greenheck certifies that the ERV models shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

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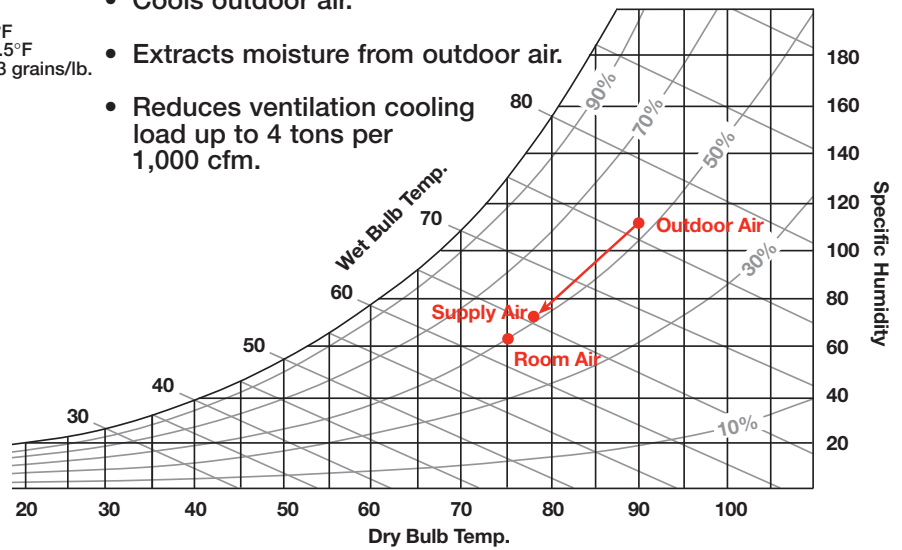
The basic objectives for providing acceptable Indoor Air Quality are to control indoor contaminant levels while maintaining desired indoor air temperature and humidity. Compliance with the prescribed ventilation rates in ASHRAE Standard 62 appear to satisfy the contaminant issue. However, simply increasing outdoor air requirements with "traditional" HVAC systems may not address the humidity issue properly and often leads to significant energy cost increases.

The best solution for most commercial and institutional facilities will include an enthalpy wheel product. These products transfer temperature and moisture properties from one airstream to another. The result is capturing the cooling or heating energy from the exhaust air before it leaves the HVAC system. This product concept and its energy transfer capabilities are illustrated below.

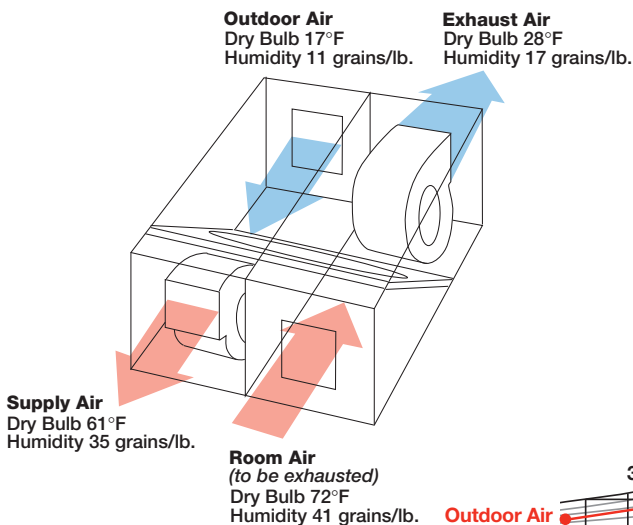
SUMMER



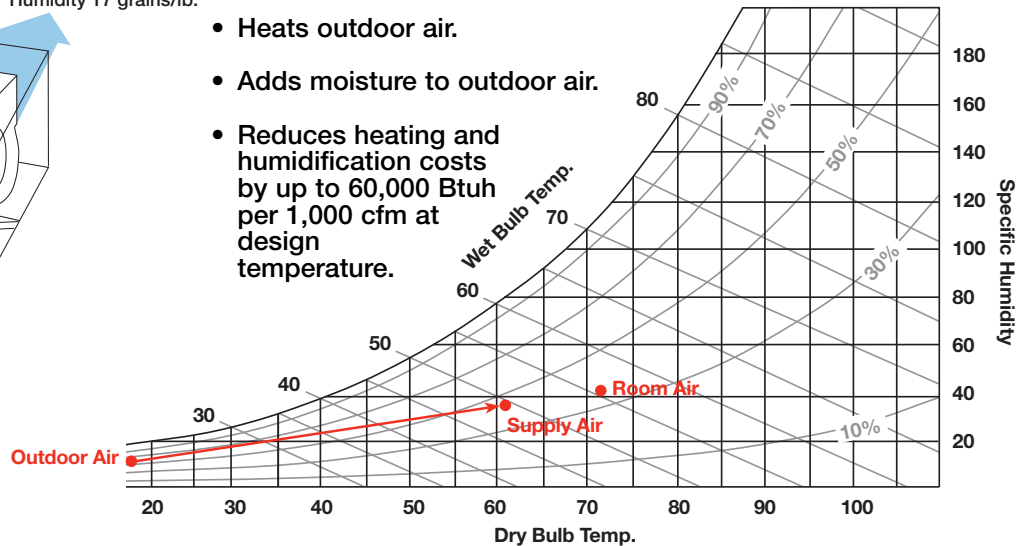
- Cools outdoor air.
- Extracts moisture from outdoor air.
- Reduces ventilation cooling load up to 4 tons per 1,000 cfm.



WINTER



- Heats outdoor air.
- Adds moisture to outdoor air.
- Reduces heating and humidification costs by up to 60,000 Btuh per 1,000 cfm at design temperature.



The Greenheck ERV product line provides complete airflow performance coverage from 400 cfm to 12,000 cfm. Four product arrangements offer installation flexibility for both interior and exterior applications (see page 5). All models include the latest technology for air to air energy transfer. Light-weight polymer energy transfer wheels with a permanently bonded silica gel coating, require minimal maintenance and are a key contributor to economically priced energy recovery ventilators. Standard features are listed below.



Features of Greenheck ERV products

- Licensed to bear the AMCA seal for Air Performance.
- Enthalpy wheel certified by ARI Standard 1060 for recovering both sensible and latent energy (Sensible only wheel optional).
- Energy recovery wheel with long, reliable life.
- Quiet running, forward curved blowers.
- Housing lined with foil faced insulation.
- Adjustable motor pulleys for final system balancing.
- All internal electrical components are factory wired. Motor starters and disconnect switch are standard.
- Neoprene isolation on motor/blower assembly to minimize noise transmittance to building is standard.
- Compact housing and multiple ducting arrangements for maximum design flexibility.
- All exterior arrangements are provided with intake and exhaust hoods as standard.

These product features contribute to the key benefits of low maintenance, effective control of humidity and economical IAQ solutions.

Low Maintenance

Proper maintenance is the key to extending the life of any component within an HVAC system.

One way to help assure that maintenance is done properly is to minimize the work involved for the people who perform it. With this in mind, we designed our energy recovery ventilators so that minimal maintenance is required. Here's how:

- Removable side or hinged panels provide easy access to energy wheel, blowers, motors and drive components.
- Wheel cassette slides out easily for inspection and maintenance.
- Wheel sections are easily removed, without tools for periodic cleaning.
- Filters are readily accessible.
- Moisture is transferred entirely in the vapor phase to eliminate the requirement for condensate drains.
- Light weight polymer enthalpy wheel contributes to low shaft and bearing loads, resulting in reliable, long life operation.



Benefits

Economical Solution

Low first cost and maximum energy savings combine to yield an extremely attractive payback on Greenheck Energy Recovery Ventilators. By incorporating ERVs into the HVAC system, air conditioning and heating equipment can be downsized considerably. In hot and humid climates the energy recovery ventilator cost is offset by the avoided increase in air conditioning equipment cost and payback is immediate. In many other climates, payback is typically less than one year.

Humidity Control

Humidity is an important factor to consider for providing comfortable room conditions and a healthy environment. Additionally, controlling humidity levels can prevent building asthmatic and structural problems. More than 75% of all IAQ problems start with comfort complaints. If these are not addressed, employees will continue to complain and become less productive. From the health perspective, humidity levels that are too high may promote growth of mold, bacteria, viruses and fungi. Low humidity may cause irritation and increase respiratory symptoms.

Energy recovery ventilators are perfectly suited to help control humidity. In the summer, when outdoor humidity is high, the energy wheel dehumidifies the outdoor air. This greatly reduces the latent load on the air conditioning equipment and also eliminates rising indoor humidity levels that can occur in hot, humid climates. In the winter, when outdoor air is dry, the energy wheel humidifies the outdoor air. This increases comfort and reduces the amount of humidification required.

ARRANGEMENT A - INTERIOR MOUNTED

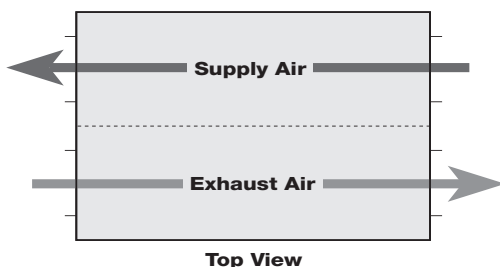


Fig. 1

Arrangements

Interior

This compact design is ideal for the space limitations that routinely complicate interior installations.

Arrangement A

Specify arrangement A for interior mounting. All ERV sizes are available in this arrangement. Fig. 1 below is typical for ERV-251, ERV-361, ERV-521 and ERV-581.

Exterior

Where roof mount or pad mount installations are preferred, Greenheck offers three arrangements to provide the flexibility to simplify system design and installation. Louvered intake hood and an exhaust hood are standard on arrangements B, C and D. The housing and hood design minimize re-entrainment of exhaust air.

Arrangement B

Ideal for roof mount installations where both exhaust and supply ducts penetrate the roof deck and attach to the bottom of the energy recovery ventilator. Fig. 2 below is typical for ERV-251, ERV-361, ERV-521 and ERV-581.

Arrangement C

Ideal for roof mount installations where the supply airstream is to be routed directly into a rooftop HVAC unit. Exhaust air enters the ERV from below.

Arrangement D

Suited for pad mounting, where both the exhaust and supply ducts connect to the end of the ERV.

Reference pages 12 and 13 for arrangement drawings and dimensions.

ARRANGEMENT B - ROOF MOUNTED

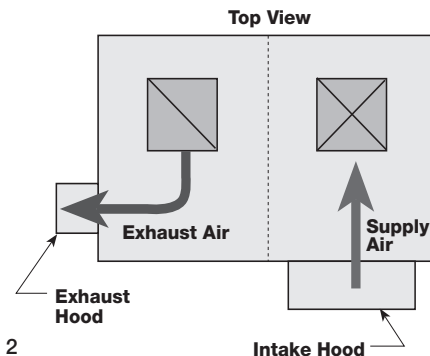


Fig. 2

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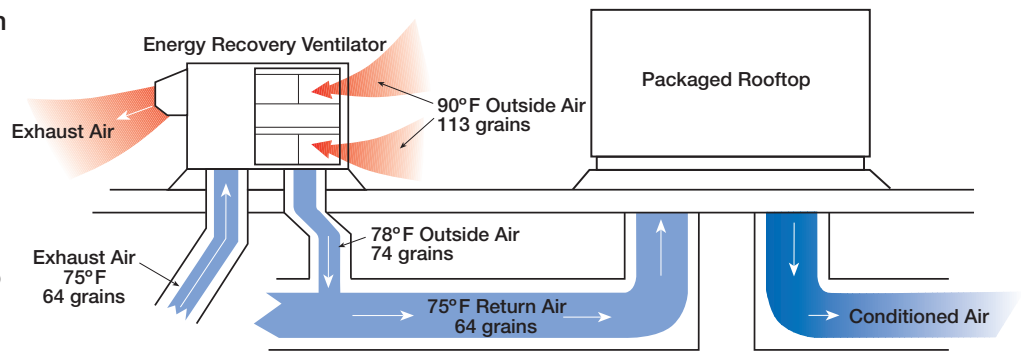
Energy Recovery Ventilators may be applied in many HVAC installations. Integrating the energy recovery ventilator into the air conditioning duct system is a common installation. This approach enables the specifying engineer to use the same basic design as traditional HVAC systems, but with the savings provided by energy recovery. The main modifications, as compared to traditional systems, simply involve routing fresh outdoor and stale exhaust air through the energy recovery ventilator. In most cases, additional ductwork is minimal.

This means of providing adequate outdoor air to the occupied spaces is the same in concept no matter how the air conditioning equipment is configured. Since the energy recovery ventilator and air conditioning equipment are integrated, or coupled together, the appropriate amount of fresh outdoor air is provided whenever the air conditioning equipment is operating.

There are many system configurations that utilize this concept. Two sample installations are shown below.

With Packaged Rooftop Equipment

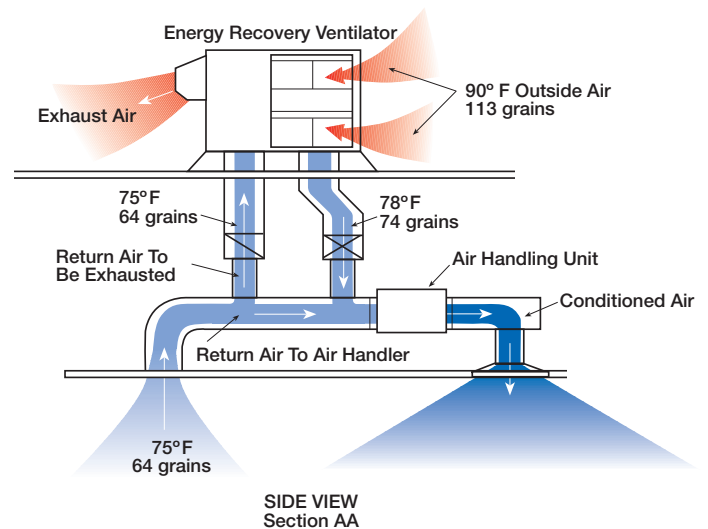
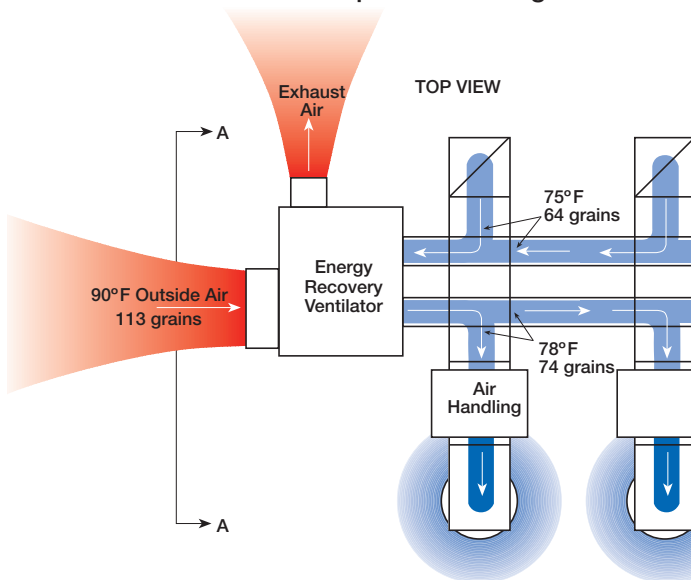
The drawing at right illustrates how energy recovery ventilators may be used in conjunction with packaged rooftop equipment. Fresh, outdoor air enters the energy recovery ventilator and is pre-treated before entering the heating / cooling equipment. The energy source for pre-treating the outdoor air is the portion of the return air to be exhausted through the energy recovery ventilator.



With Ducted Air Handlers

Energy recovery ventilators may also be used in conjunction with ducted air handling units or fan coil boxes. A single energy recovery ventilator may provide fresh outdoor air for multiple air handling units

(as shown below) or in a one-to-one ratio where a single energy recovery ventilator and air handler serves only one space. For additional design flexibility, the energy recovery ventilator may also be duct mounted.



The drawing above shows the plan view of a single energy recovery ventilator providing fresh outdoor to multiple air handling units.

The above drawing shows the elevation view of the energy recovery ventilator and air handler in an integrated duct system.

Limitations to Integrated Systems

The integrated system concept provides the simplest, lowest cost application for ERVs when the outdoor air to total supply air percentage (i.e., 25%) is the same for all spaces. However, when a single HVAC unit services multiple spaces where outdoor air requirements (as a percent of total supply air) differ significantly, the integrated system is not the best approach.

An example may help illustrate this concept. Assume that a packaged rooftop unit serves an office building and provides supply air that is made up of 25% outdoor air and 75% return. Employee A, in an office with a high thermal load, receives 200 cfm of supply air which

includes 50 cfm of outdoor air. Employee B, in an office with a low thermal load, receives only 40 cfm of supply air which includes just 10 cfm of outdoor air. In this example, employee A receives far more than the 20 cfm per person prescribed by ASHRAE Standard 62, which translates into higher energy and equipment costs to condition the extra 30 cfm. Conversely, employee B received far less than the Standard prescribes, which translates into lower productivity and potential lawsuits.

In cases as described above, integrated systems are unable to effectively address both the indoor air quality and energy conservation issues.

The De-Coupled System

De-coupled systems should be strongly considered where thermal loads vary significantly from space to space. The de-coupled concept uses a dedicated system for ventilation air delivery, which allows independent control of ventilation air and thermal conditioning. The air conditioning equipment processes 100% return air and supplies it back to the occupied space. Exhausting stale air and supplying fresh outdoor air is handled by the energy recovery ventilator.

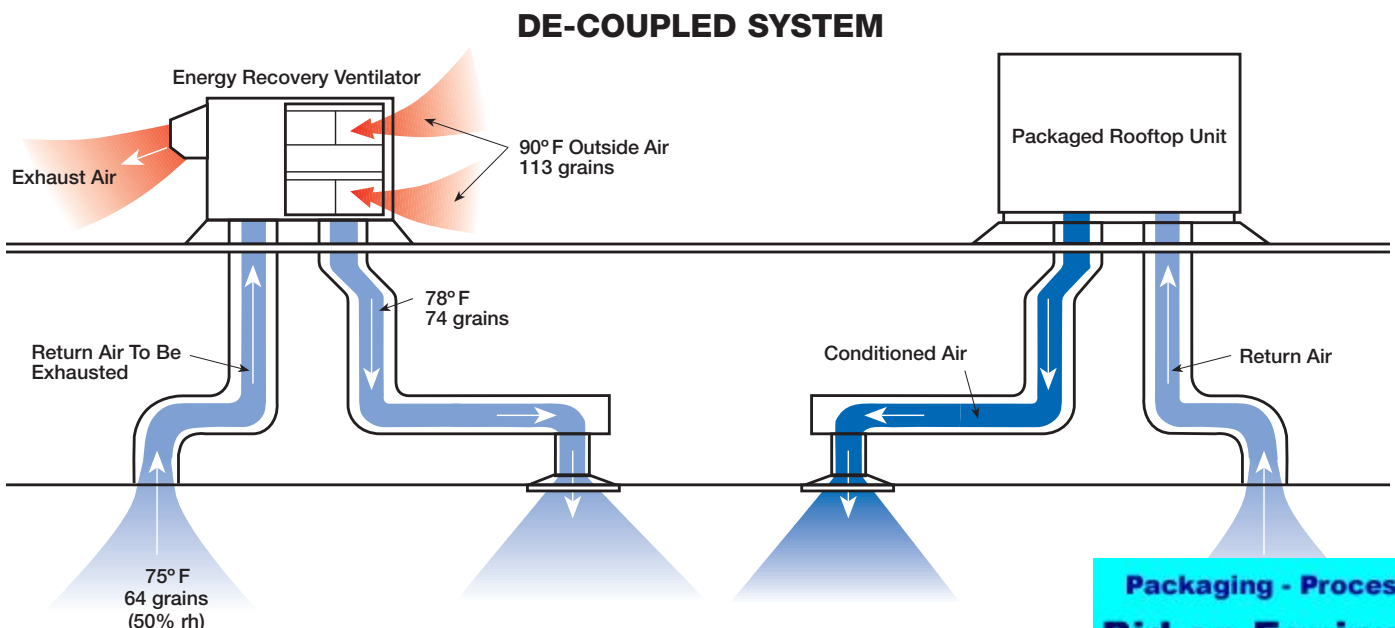
For multiple space applications where outdoor air requirements (%) vary significantly from space to space, the de-coupled system has the following advantages:

- Adequate outdoor air is supplied to all occupied spaces.

- Compliance with ASHRAE Standard 62 for all spaces can be easily demonstrated.
- Requires the lowest total outdoor air quantities, which results in the lowest energy consumption.
- Provides the lowest initial cost in most cases.

Applying the de-coupled system with energy recovery makes a good concept great. The energy recovery ventilator conditions the outdoor air to temperature and humidity values at, or near, room conditions. Depending on the climate and preference of the specifying engineer, supplemental heating or cooling for the ventilation air may not be necessary. If supplemental heating or cooling is desired Greenheck's Models ERH, ERCH, or ERT should be considered.

The drawing below illustrates the de-coupled design concept with energy recovery.



The airflow performance data shown applies to arrangement A and is licensed to bear the AMCA seal for Air Performance. Performance data for other arrangements may differ slightly. For specific performance for all arrangements, use Greenheck's Computer Aided Product Selection (CAPS) program. All models are available in A, B, C, & D arrangements.

NOTES: 1. Performance tables show EXTERNAL static pressure capabilities.
2. Bhp, Watt and Amp values shown are for one blower motor only.

Model ERV-251

ERV-251S (Standard Airflow)

Supply & Exhaust

Direct Drive

NOMINAL RPM	MAX. AMPS 115/230	MAX. WATTS (input)		EXTERNAL STATIC PRESSURE (in. wg)						
				0.250	0.375	0.500	0.625	0.750	1.000	1.250
950	3.0/1.5	300	CFM	563	536	498	450	378		
1,150	5.3/2.7	530	CFM	700	680	658	634	597	513	
1,350	8.6/4.3	855	CFM	834	818	801	783	762	711	642

ERV-251H (High Airflow)

Supply & Exhaust

Direct Drive

NOMINAL RPM	MAX. AMPS 115/230	MAX. WATTS (input)		EXTERNAL STATIC PRESSURE (in. wg)						
				0.250	0.375	0.500	0.625	0.750	1.000	1.250
1,150	5.0/2.5	500	CFM	802	777	742	706	667		
1,340	8.1/4.1	810	CFM	958	937	915	887	857	792	
1,520	11.5/5.8	1,150	CFM	1089	1070	1051	1032	1008	954	895

Speed (RPM) shown is nominal. Performance is based on actual speed of test. Performance ratings do not include the effects of appurtenances in the airstream. Performance at speeds of 950, 1150, and 1340 RPM are obtained with a speed control at 115 volts only. See note below.

Model ERV-361

ERV-361S (Standard Airflow)

Supply & Exhaust

Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
1,000	1,495	RPM	777	863	941	1015	1147	1277	1397	1515
		BHP	0.21	0.25	0.29	0.33	0.41	0.49	0.58	0.69
1,200	1,794	RPM	899	974	1043	1109	1232	1343	1453	1557
		BHP	0.34	0.39	0.43	0.48	0.58	0.68	0.78	0.87
1,400	2,093	RPM	1023	1091	1153	1212	1324	1429	1527	1618
		BHP	0.52	0.58	0.64	0.68	0.80	0.92	1.03	1.14
1,600	2,392	RPM	1149	1212	1269	1323	1424	1520	1613	1701
		BHP	0.75	0.82	0.89	0.95	1.07	1.20	1.34	1.47

ERV-361H (High Airflow)

Supply & Exhaust

Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
1,600	2,392	RPM	1006	1065	1122	1175	1275	1367	1457	1542
		BHP	0.58	0.64	0.69	0.74	0.86	0.96	1.07	1.19
1,800	2,691	RPM	1119	1172	1223	1272	1365	1452	1533	1613
		BHP	0.82	0.88	0.93	0.99	1.12	1.25	1.36	1.49
2,000	2,990	RPM	1232	1279	1326	1372	1458	1541	1618	1692
		BHP	1.11	1.17	1.23	1.30	1.43	1.58	1.72	1.85
2,200	3,289	RPM	1347	1389	1433	1474	1555	1633		
		BHP	1.46	1.53	1.60	1.67	1.81	1.97		

Gross supply air performance ratings for direct and belt drive models (airflow, pressure, and power) are at port 2 with port 1, port 3 and port 4 at 0.0 in. wg. Gross exhaust air performance ratings for direct and belt drive models (airflow, pressure, and power) are at port 3 with port 1, port 2 and port 4 at 0.0 in. wg. Power rating (BHP) does not include drive losses. Performance ratings do not include the effects of appurtenances in the airstream.

Model ERV-521
ERV-521S (Standard Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
2,200	2,183	RPM	830	881	933	981	1072	1155	1238	1315
		BHP	0.72	0.80	0.87	0.95	1.09	1.25	1.41	1.57
2,700	2,679	RPM	998	1040	1081	1124	1203	1278	1350	1416
		BHP	1.29	1.38	1.47	1.57	1.75	1.93	2.12	2.30
3,200	3,175	RPM	1168	1203	1240	1274	1345	1412	1477	
		BHP	2.11	2.21	2.32	2.43	2.65	2.86	3.08	

ERV-521H (High Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
3,100	3,076	RPM	980	1017	1054	1089	1159	1226	1290	1355
		BHP	1.57	1.65	1.73	1.82	1.99	2.18	2.36	2.54
3,700	3,671	RPM	1156	1187	1219	1249	1309	1367	1425	1480
		BHP	2.62	2.72	2.83	2.92	3.12	3.33	3.55	3.77
4,300	4,267	RPM	1334	1361	1388	1415	1467	1519	1569	
		BHP	4.08	4.20	4.31	4.43	4.65	4.89	5.13	

Model ERV-581
ERV-581H (High Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
4,300	2,064	RPM	637	687	733	772	850	923	988	1055
		BHP	1.20	1.35	1.49	1.61	1.88	2.16	2.42	2.73
5,050	2,424	RPM	731	774	817	855	922	989	1053	1111
		BHP	1.89	2.05	2.23	2.39	2.68	3.00	3.33	3.65
5,800	2,784	RPM	826	866	903	939	1004	1061	1120	1177
		BHP	2.79	2.99	3.18	3.38	3.74	4.07	4.44	4.83

Model ERV-522
ERV-522S (Standard Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
5,000	2,416	RPM	754	794	831	869	943	1011	1072	1134
		BHP	2.20	2.39	2.57	2.76	3.15	3.54	3.89	4.30
5,750	2,779	RPM	855	892	924	957	1022	1087	1146	1201
		BHP	3.28	3.49	3.70	3.92	4.33	4.81	5.26	5.67
6,500	3,141	RPM	956	991	1021	1049	1108	1164	1222	1276
		BHP	4.67	4.90	5.15	5.39	5.88	6.33	6.89	7.41

ERV-522H (High Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
6,000	2,067	RPM	535	581	619	660	731	797	857	913
		BHP	1.57	1.79	1.96	2.16	2.55	2.94	3.33	3.72
7,500	2,584	RPM	646	686	722	753	818	877	930	983
		BHP	2.90	3.20	3.46	3.68	4.17	4.66	5.12	5.62
9,000	3,100	RPM	763	794	827	857	910	964	1016	1063
		BHP	4.90	5.20	5.57	5.89	6.42	7.01	7.60	8.18

Model ERV-582
ERV-582H (High Airflow)
Supply & Exhaust
Belt Drive

CFM	OV		EXTERNAL STATIC PRESSURE (in. wg)							
			0.125	0.250	0.375	0.500	0.750	1.000	1.250	1.500
9,000	2,254	RPM	595	629	661	692	746	797	843	888
		BHP	3.61	3.95	4.26	4.54	5.25	5.89	6.48	7.09
10,500	2,630	RPM	685	713	741	769	820	867	911	952
		BHP	5.60	5.99	6.38	6.74	7.44	8.27	9.03	9.74
12,000	3,005	RPM	776	800	825	849	897	941	982	
		BHP	8.24	8.66	9.12	9.56	10.36	11.19	12.13	

Gross supply air performance ratings (airflow, pressure, and power) are at port 2 with port 1, port 3 and port 4 at 0.0 in. wg. Gross exhaust air performance ratings (airflow, pressure, and power) are to port 3 with port 1, port 2 and port 4 at 0.0 in. wg. Power rating (BHP) does not include drive losses. Performance ratings do not include the effects of appurtenances in the airstream.

Dampers - Internally Mounted

A wide variety of dampers are available in either gravity or motorized operation. Dampers are internally mounted at the supply and exhaust inlet. Motorized dampers are factory wired to single point power connection.

Filters

Standard size 2 inch pleated, medium efficiency filters and filter racks are available for supply and/or exhaust air streams.

Model	Filter Size	Quantity
ERV-251	16 x 25	1
ERV-361	16 x 20	2
ERV-521	16 x 25	3
ERV-581	16 x 20	6
ERV-522	16 x 25	7
ERV-582	20 x 25	6

All dimensions shown in inches.

Painted Exteriors

Greenheck's Permatecor coating is available for a durable, long lasting finish. Decorative paints are available in a variety of colors to match existing building fixtures. Consult your Greenheck representative for paint selections.

Roof Curbs

Prefabricated roof curbs are available to ensure compatibility between ventilator, curb and roof opening. Standard construction is galvanized steel and includes fiberglass insulation. Curbs are supplied with duct adapters. Consult factory for curb outside dimensions and roof openings required.

Double Wall Construction

The supply and exhaust side are internally lined with 20 gauge galvanized steel.

Weather Hoods

A louvered intake hood with 2 inch aluminum mesh filters and exhaust hood with an integral backdraft damper are available.

Dirty Filter Sensors

Pressure taps sense excessive pressure drop across the filter and sends a signal to a dirty filter indicator light. Light and control box are available from the factory.

Rotation Sensors

Sensor monitors wheel rotation. Signal may be sent to remote indicator light. Light and control box are available from the factory.

Economizer Control (Free Cooling)

When cool outdoor air is available, the energy wheel may be controlled to provide free cooling. Economizer operation can be initiated by the unit sensors alone or in conjunction with a call for cooling (field wired). Two factory installed options are available.

- **Wheel Off:** De-energizes the wheel when the outdoor temperature is below the field adjustable set point (enthalpy sensor also available). An automatic economizer override is included to engage the wheel for winter heating operation.
- **Wheel Modulation:** Modulates the energy recovery wheel to maintain a 55°F discharge temperature during economizer operation.

Note: Control centers in Greenheck energy recovery ventilators enable control of the energy wheel and fans via 24-volt control signals (by others). Controls by others may be preferred when air handling units are equipped with an economizer section.

Blower Speed Control

Speed control for system balancing is available for model ERV-251. Belt driven models are available with two speed motors or variable frequency drives.

Hinged Access Doors

Panel side doors are a standard feature on all units. Hinged access doors are available on models ERV-361, ERV-521, ERV-581, ERV-522 and ERV-582. Access doors are removable hinge type with lift and turn latches for access to internal components.

Additional Accessories:

- GFCI Service Outlet (wiring by others)
- Service Lights (wiring by others)
- Sensible Wheel Only
- Remote Panels
- Spare Wheel Segments
- Duct Flanges

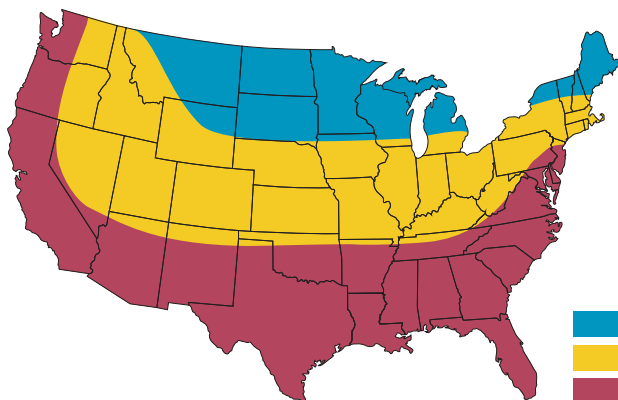
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Frost Control Options

The frost threshold is the outdoor temperature at which frost will begin to form on the ERV wheel. For Greenheck Energy Recovery Ventilators, the frost threshold is typically below 5°F. Frost threshold is dependent on indoor temperature and humidity. The table at right shows how the frost threshold temperatures vary depending on indoor conditions.

FROST THRESHOLD TEMPERATURE

Indoor RH at 70°F	Frost Threshold Temperature
20%	-10°F
30%	-5°F
40%	0°F



- Pre Heat Frost Control Recommended *
- Timed Exhaust Frost Control Recommended *
- No Frost Control Needed

Because Greenheck Energy Recovery Ventilators have a low frost threshold, frost control options are not necessary in many climates. Where outdoor temperatures may drop below the frost threshold during the ERV operational hours, three frost control options are available. The map at left indicates the frost control options, if any, that are appropriate based on climactic conditions during typical 16 hour per day operation.

* Modulating Wheel Frost Control can also be used in these areas.

Timed Exhaust Frost Control

Timed exhaust frost control turns the supply blower power off and on using field adjustable timer settings when outdoor temperature falls below the frost threshold. The temperature set points are field adjustable with a factory supplied thermostat.

Timed Exhaust is appropriate for climates with limited HVAC system operation when outdoor temperatures are below 0°F.

Modulating Wheel Frost Control

Modulating the energy wheel for frost control enables continuous operation when outdoor temperatures are below the frost threshold. A VFD reduces wheel speed when the outdoor air temperature falls below the frost threshold set point **and** upon an increase in the differential pressure across the energy wheel. The temperature and pressure differential set points are made at the factory, but are field-adjustable. The VFD will be fully programmed and wired at the factory.

Modulating wheel frost control is available on all sizes except the ERV-251.

Preheat Frost Control

Preheat Frost Control enables continuous operation when outdoor temperatures are below the frost threshold. An electric heater warms outdoor air above the frost threshold before it enters the ERV wheel.

Two heater control options are available:

- **Outdoor Air Temperature:** The heater will be energized when the outdoor air temperature is below the field adjustable outdoor air set point.
- **Wheel Pressure Differential:** The heater will be energized when the outdoor air temperature is below the field adjustable outdoor air set point **AND** the pressure differential across the wheel is greater than the set point (an increase in differential pressure indicates that the wheel is frosting).

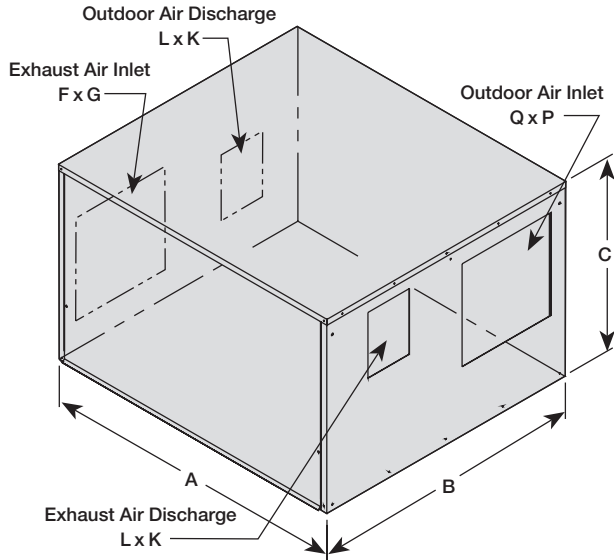
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MODELS ERV-251, ERV-361, ERV-521 AND ERV-581

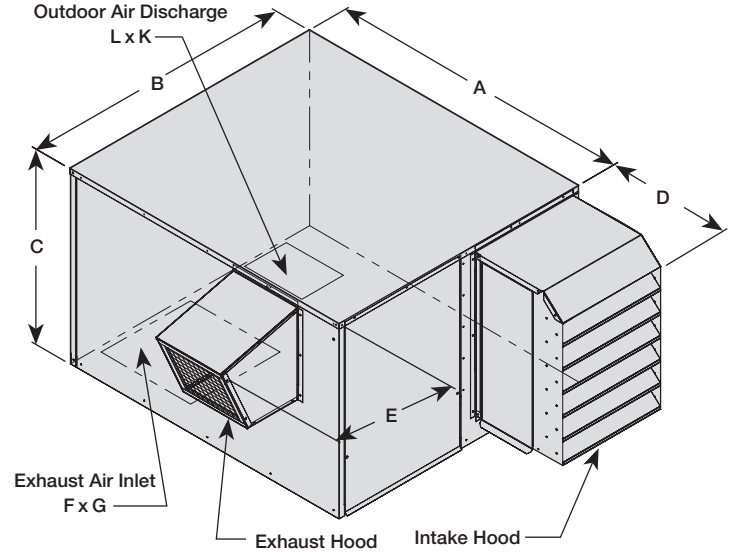
Model	Exterior Dimensions					Duct Dimensions						Weight (lbs)
	A	B	C	D	E	F	G	K	L	Q	P	
ERV-251	46	34	27	12	8	10	16	6 $\frac{3}{4}$	7	10	16	340
ERV-361	62	51	34	18	15	18	18	8 $\frac{3}{8}$	11 $\frac{1}{2}$	19	18	860
ERV-521	67	67	44	16	15	24	24	10 $\frac{3}{4}$	13 $\frac{1}{2}$	26	26	1,290
ERV-581	75	70	67	16	22	22	27	16	18 $\frac{3}{4}$	28	48	1,470

All dimensions shown are in inches. Weight assumes outdoor unit with filters, weatherhoods, and supply damper.

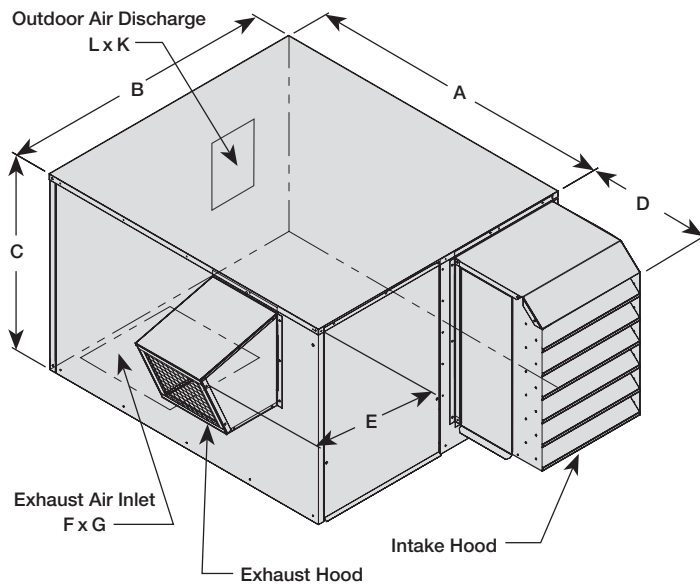
Arrangement A



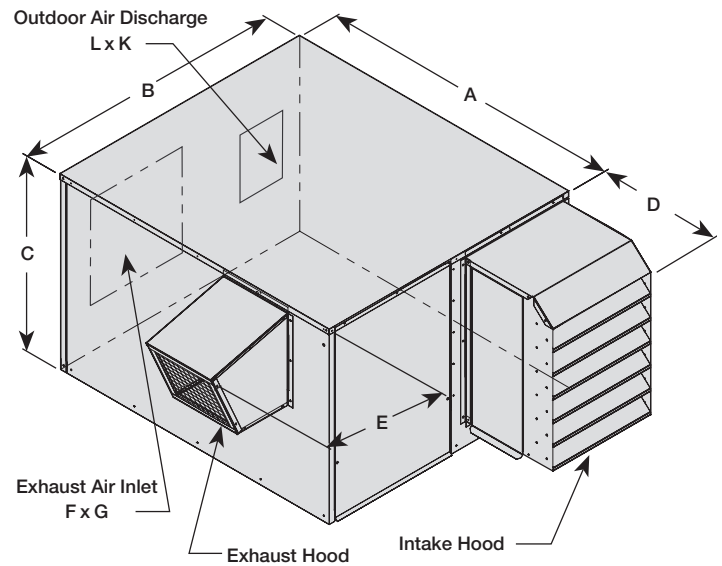
Arrangement B



Arrangement C



Arrangement D



Service Clearance

Installation must allow clearance for access to the energy recovery wheel on the supply side. Minimum clearances are shown in the table at right. Page 4 illustrates the side panel that enables wheel access.

Model	Supply Side	Exhaust Side
ERV-251	32	30
ERV-361	44	30
ERV-521	60	40
ERV-581	65	40

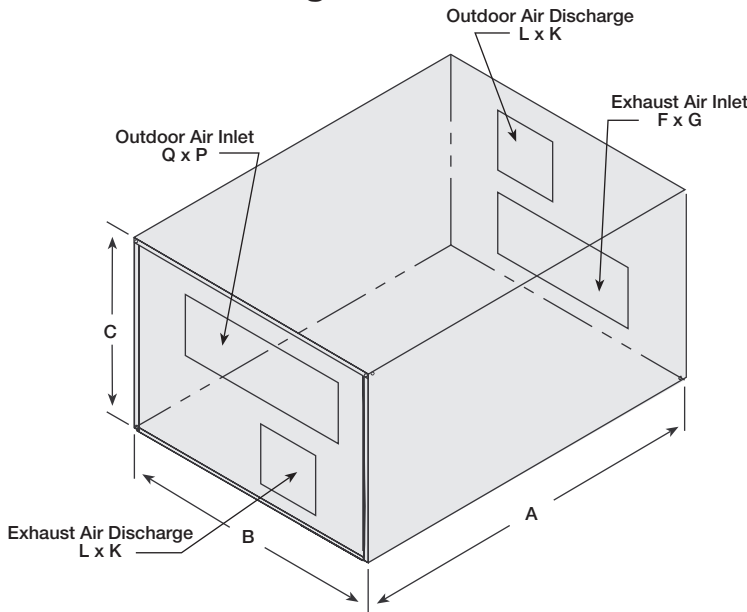
All dimensions shown are in inches.

MODEL ERV-522 AND ERV-582

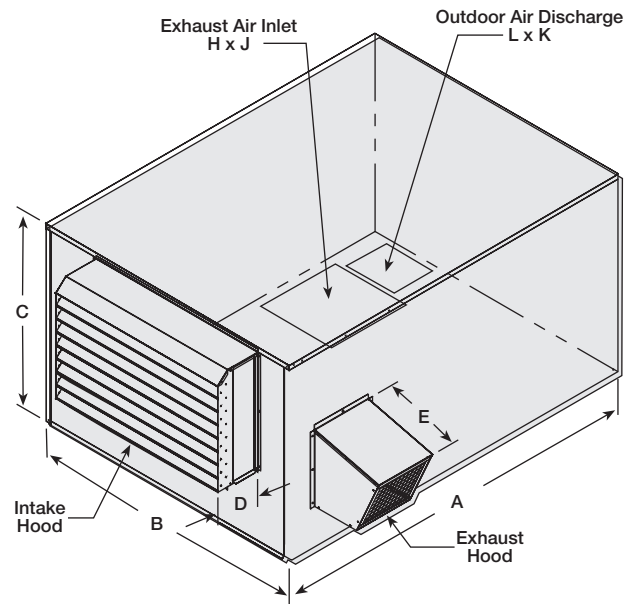
Model	Exterior Dimensions					Duct Dimensions								Weight (lbs.)
	A	B	C	D	E	F	G	H	J	K	L	Q	P	
ERV-522S	124	84	64	16	19	48	25	26	36	16	18 5/8	60	25	3,230
ERV-522H	124	84	64	16	19	48	25	26	36	19	22	60	25	3,230
ERV-582H	146	97	77	17 1/2	26 3/4	60	28	31	38	23	25	70	30	3,700

All dimensions shown are in inches. Weight assumes outdoor unit with filters, weatherhoods, and supply damper.

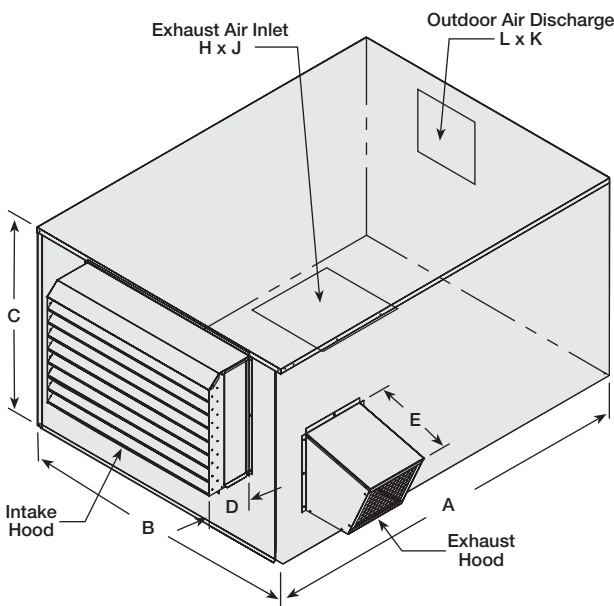
Arrangement A



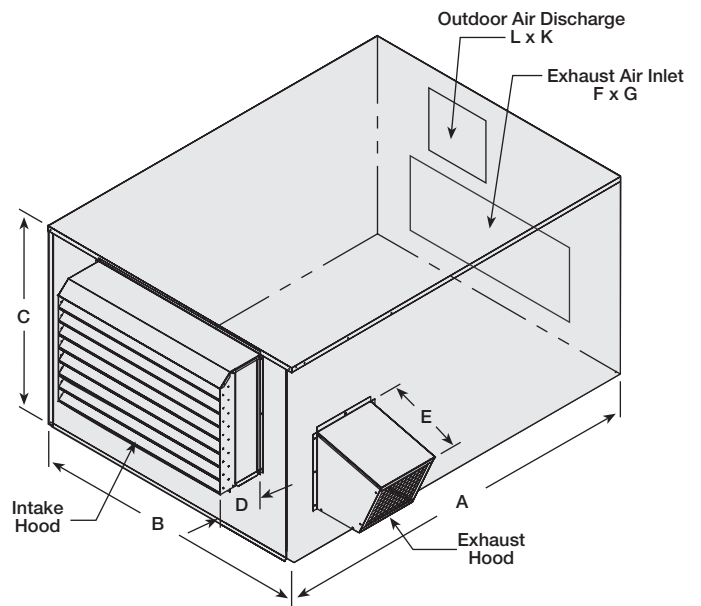
Arrangement B



Arrangement C



Arrangement D



Service Clearance

The installation must allow clearance for access to the energy recovery wheels and servicing. For model ERV-522, allow a clearance of 38 inches on all sides. For model ERV-582, allow a clearance of 42 inches on all sides.

Model ERV-522 and ERV-582 energy wheels are mounted in an upright position, side by side. For servicing, the energy wheels slide out of the ventilator at opposite corners.

Motor Specifications

Blower motor information must be specified to select unit. The horsepower, voltage, phase and enclosure availability is presented in the table on the right. If exhaust and supply blower horsepower are different, consult the CAPS program.

Model	Open			TE		2 Speed Open	
	115/1	230/1	230/460/3	230/1	230/460/3	230/1	230/460/3
ERV-251S*	1/4	1/4	-	-	-	-	-
ERV-251H*	1/2	1/2	-	-	-	-	-
ERV-361*	-	1/4 - 2	1/4 - 2	1/4 - 2	1/4 - 2	1/2 - 1	1/2 - 1 1/2
ERV-521*	-	1/2 - 3	1/2 - 5	1/2 - 1 1/2	1/2 - 5	1/2 - 1	1/2 - 3
ERV-581*	-	-	1 - 5	-	1 - 5	-	1 - 3
ERV-522*	-	1 1/2 - 3	1 1/2 - 15	1 1/2	1 - 15	-	1 - 7 1/2
ERV-582*	-	-	1 1/2 - 15	-	1 - 15	-	1 - 7 1/2

UL Listing is available on most open drip proof motors. * Energy wheel drive motor is only available with open drip proof motors.

Minimum Circuit Amps (MCA) Calculations for ERV Units Wheel Drive and 24v Internal Control Amp Single or Three Phase ERV Units

Model	Wheel Drive Amps			24v Control Amps
	115	208/230	460	
ERV-251	0.6	0.6	na	0.5
ERV-361	na	1.2	0.6	1
ERV-521	na	2.8	1.4	1
ERV-581	na	1.6	0.8	1
ERV-522	na	5.6	2.8	1
ERV-582	na	3.2	1.6	1

Standard Electric Preheat kW

Model	115/1	208/1	230/1	208/3	230/3	460/3
ERV-251	2.5	2.1, 4.1	2.5, 5	na	na	na
ERV-361	na	na	na	4.1, 8.2, 12.3	5, 10, 15	5, 10, 15
ERV-521	na	na	na	8.2, 12.3, 15.5	10, 15, 19	10, 15, 20, 25, 30
ERV-581	na	na	na	12.3, 15.5	15, 19	15, 20, 25, 30, 38
ERV-522	na	na	na	15.5	19	20, 25, 30, 45
ERV-582	na	na	na	15.5, 24.5	19, 30	20, 38, 50

MCA Example Calculation

Greenheck ERV Selected: ERV-361S-B, 2 hp supply motor, 1 1/2 hp exhaust motor, 15kW preheater operating at 460v/3 phase.

- Step 1: Consult NEC table (not shown) for 2 hp supply motor
amps = 3.4 A.
- Step 2: Consult NEC table (not shown) for 1 1/2 hp exhaust motor
amps = 2.6 A.
- Step 3: Calculate 15kW preheater amp draw = $15,000W / [460 \times \sqrt{3}] = 18.8$ A. If no preheater is used skip step 3.
- Step 4: Wheel drive amps for ERV-361 from table above = 0.6 A.
- Step 5: 24v Control Amps for ERV-361 from table above = 1.0 A.
- Step 6: MCA = Amperage total from steps 1 thru 5 X 1.25.
MCA = (3.4 + 2.6 + 18.8 + 0.6 + 1.0) 1.25 = 33 A.

Note: Calculations are approximate, use the CAPS Selection Program for exact MCA calculations.

Filter Pressure Drop

Model	CFM	Intake Hood w/ 2 in. alum filters	Pleated 2 in. filters
251	500	0.09	0.09
	1,000	0.32	0.19
361	1,000	0.09	0.10
	2,200	0.45	0.28
521	2,500	0.13	0.14
	4,500	0.45	0.32
581	4,500	0.17	0.15
	5,500	0.30	0.24
522	6,000	0.15	0.14
	9,000	0.40	0.25
582	9,000	0.13	0.16
	12,000	0.45	0.27

General: Energy Recovery Ventilator shall be as manufactured by “Greenheck” or approved equal, provided all specifications are met. Greenheck Model ERV equipment is used as the basis of design. Units shall be listed per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings shall be ARI Certified. Ventilators shall bear the AMCA Certified Rating Seals for air performance. Performance shall be as scheduled on plans. Outdoor air shall not mix with exhaust air in a common plenum. Exhaust discharge and outside air intake shall not be located on the same side on roof top units.

Unit Casing and Frames: Unit shall be of internal frame type construction of galvanized steel. Frame and panels shall be G90 galvanized steel. All panels exposed to the weather shall be a minimum of 18 gauge galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. All metal-to-metal seams shall be sealed, requiring no caulking at job site. Permatecor exterior finish is available for outdoor units. Unit base to be designed for curb mounting. Unit base shall over hang the curb for a positive seal against water run-off.

Weatherhoods: Weatherhoods shall be of the same finish as the unit. Outdoor air weatherhood shall incorporate a louvered design and moisture eliminator. Weatherhoods shall be tested in accordance with AMCA Standard 500-L to prevent water penetration up to 3 in/hr at 29 mph. Moisture eliminator shall be aluminum, consisting of corrugated mesh to eliminate water penetration into unit.

Insulation: Unit casing to be insulated with 1 inch – 3 lb. fiberglass with Foil-Scrim-Kraft facing. Insulation shall be in accordance with NFPA 90A and tested to meet UL 181 erosion requirements and secured to unit with water proof adhesive and permanent mechanical fasteners.

Energy Recovery Wheel: Wheel shall be of the enthalpy type for both sensible and latent heat recovery and be designed to ensure laminar flow. Energy transfer ratings must be ARI Certified to Standard 1060 and bear the ARI Certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060. Ratings “in accordance with 1060” without certification are not acceptable. Desiccant shall be silica gel for maximum latent energy transfer. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.

Wheel design shall consist of removable segments (for wheels greater than 26 in. diameter) for ease of service and/or cleaning. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat recovery after cleaning. Wheels with sprayed on desiccant coatings are not acceptable. Wheels with desiccant applied after wheel formation are not acceptable. Energy recovery device shall transfer moisture entirely in the vapor phase.

Energy recovery drive belt material shall be high strength urethane and shall be factory installed in a pre-stretched state, eliminating the need for field belt tension adjustment. Link style belts are not acceptable.

Access Doors: All components shall be easily accessible through removable doors for exhaust, supply, filter, and damper compartments. Energy recovery wheels (smaller than 54 inches) shall be mounted in a slide-out track for ease of inspection, removal, and cleaning.

Roof Curbs: Roof curb to be supplied by unit manufacturer for field assembly. Curb shall consist of die formed galvanized steel sections. Curb shall be full perimeter type with gasketing provided for field installation between curb and unit base.

Fan Sections: Centrifugal fans to be double width, double inlet, single fan forward curved type. All blower wheels shall be statically and dynamically balanced. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds. Separate motors for exhaust and supply blowers shall be provided. Adjustable sheaves on belt-driven fans with motors less than 10 hp shall allow independent balancing of exhaust and supply airflows. Optional speed controllers on direct-drive fans shall allow independent balancing of exhaust and supply airflows. Fan and motor assemblies are mounted to unit base with neoprene isolators as standard. Fans shall be located in draw-through position in reference to the energy recovery wheel.

Motors and Drives: Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase, and enclosure. Belt drive motors shall be factory mounted to an adjustable motor plate having two heavy duty adjusting bolts for alignment and belt tension. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts; 10 horsepower and less shall be supplied with an adjustable drive pulley. Energy wheel motors and direct drive motors shall have integral overload protection.

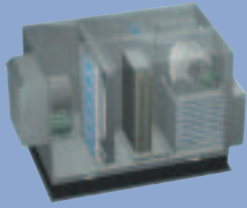
Filters: Supply and exhaust air filters shall be 2 inch thick pleated fiberglass, 30% efficient and tested to meet UL Class 2. Filter racks shall be die formed galvanized steel.

Electrical: All internal electrical components shall be factory wired for single point power connection. All electrical components shall be UL Listed, Approved or Classified where applicable and wired in compliance with the National Electrical Code.

For Model ERV-251, weatherproof, integral door interlocking disconnect switch and terminal strip shall be supplied as standard components in the control center. Optional features include motor contactors, 24 VAC control circuit, and fusing.

For Models ERV-361 and above, weatherproof, integral door interlocking disconnect switch, motor starters, control circuit fusing, and control transformer for 24 VAC circuit shall be supplied as standard components in the control center. Motor starters consist of a contactor and Class 20 adjustable overload protection and shall be provided for all motors in the unit.

Additional Energy Recovery Products



Models ERH / ERCH

Combine the advantages of the energy wheel with supplemental heating or cooling.



Model ERT

Combines the benefits of the energy wheel and a wrap around heatpipe with supplemental heating and cooling.



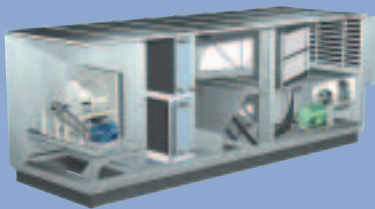
Model ERM

The Model ERM energy recovery modules offer the advantages of Greenheck's energy recovery wheel for use in built-up ventilation systems.



MiniVent

The MiniVent energy recovery ventilator is designed for applications requiring 300-750 cfm. The unit is designed for floor mount, wall mount or hanging from the ceiling.



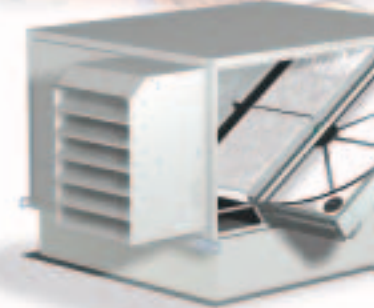
Model APEX

The Model APEX is designed for energy recovery applications requiring up to 20,000 cfm. Supplemental heating or cooling is available.

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Our Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. The energy recovery wheel is warranted to be free from defects in material and workmanship for a period of five years from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

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