RenewAire®
Energy Recovery Ventilation

DN SERIES DOAS

DEDICATED OUTDOOR AIR SYSTEMS AVAILABLE WITH PACKAGED REFRIGERATION & ENERGY RECOVERY

- DOAS units with static-plate total energy recovery
- 375-4,950 CFM
- Single-point connection, direct-drive EC fans, injected-foam panels
- Modular design
- Low dew point supply air
- Outdoor

VENTILATION SOLUTIONS FOR EVERY APPLICATION

DN SERIES: DEDICATED OUTDOOR AIR SYSTEMS WITH ENERGY RECOVERY

DEFICIENT INDOOR AIR QUALITY IS A THREAT

As **buildings get tighter to seal weather out, they seal in contaminants**, causing a reduction in indoor air quality (IAQ). Typical contaminants include off-gassing from carpeting, furniture and building materials, excess humidity and mold, odors, cooking and cleaning fumes, CO2, hair and fibers, to name a few.

Deficient IAQ is a threat since it can harm occupant health and cognitive function, damage structures and hurt the bottom line. It's especially concerning since people spend about 90% of their time indoors, and indoor air can be two to five times—and up to 100 times—more polluted than outdoor air. The EPA ranks indoor air pollution as a top-five health risk.[1]

ADVERSE EFFECTS OF DEFICIENT IAQ

HEALTH PROBLEMS

Deficient IAQ can cause allergies, headaches, coughs, asthma, skin irritations and breathing difficulties, as well as cancer, liver disease, kidney damage and nervous-system failure.

COGNITIVE IMPAIRMENT

Harvard and Berkeley Lab found that CO2—a constituent of exhaled breath—negatively impacts thinking and decision-making at levels commonly found indoors.[2]

DISEASE TRANSMISSION

Ventilation with outdoor air is vital to diluting airborne contaminants and decreasing disease transmission rates.

REDUCED PRODUCTIVITY

Berkeley Lab found that poor IAQ can cost $200 billion in debilitated worker performance and $58 billion in lost sick time.[3]

VENTILATION CAN ENHANCE IAQ AND DECREASE THE TRANSMISSION OF AIRBORNE INFECTIOUS DISEASES, INCLUDING COVID-19:
BIT.LY/COVID19WP_22

[1] "Why Indoor Air Quality is Important to Schools," U.S. Environmental Protection Agency (EPA), https://bit.ly/2SoyRJc.

[2] Romm, "Exclusive: Elevated CO2 Levels Directly Affect Human Cognition, New Harvard Study Shows," Climate Progress, https://bit.ly/2Vp6AE2.

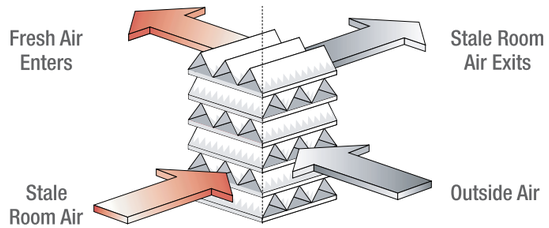
[3] Alevantis, Berman, Mills, Perlman, "The Costs and Financial Benefits of Green Buildings," U.S. Green Building Council (USGBC), https://bit.ly/4fOFjkz.

HIGHEST-QUALITY INDOOR AIR VIA VENTILATION

The solution to pollution is dilution achieved via **increased and balanced ventilation**, which is the most effective way to realize cleaner and healthier indoor air. With enough controlled fresh and filtered outdoor air coming in to replace equal parts of stale indoor air via balanced design, IAQ will be enhanced.

This can be done energy-efficiently, cost-effectively, and sustainably with RenewAire's energy recovery ventilation. Our enthalpic core allows the otherwise-wasted sensible and latent energy to transfer between the exhaust and outdoor airstreams which conditions the incoming outdoor air. This is done without the airstreams mixing or needing any condensate drains. The results are improved IAQ and humidity control, greater ventilation efficiency, and substantial energy cost savings.

AIRSTREAMS DO NOT MIX AND POLLUTANTS ARE NOT TRANSFERRED ACROSS PARTITION PLATES



ASHRAE BUILDING CODES & STANDARDS

With the goal of building sustainably and creating healthy environments for all, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has written several standards and guidelines. By enhancing IAQ and saving energy, RenewAire technologies provide the means to meet and exceed all ASHRAE standards and guidelines. Following these parameters leads to greener structures and healthier occupants.

- **ASHRAE Standard 62.1:** "Ventilation for Acceptable Indoor Air Quality" is the recognized standard for designing ventilation systems to achieve acceptable IAQ. ERVs play a key role by creating cleaner and healthier indoor air while optimizing energy efficiency.
- **ASHRAE Standard 90.1:** "Energy Standard for Buildings Except Low-Rise Residential Buildings" is a benchmark for commercial building energy codes in the U.S. and across the world. ERVs are required in several instances based on climate zone and percent of outdoor air at full design airflow rate.

RENEWAIRE VENTILATION SOLUTIONS IMPROVE HEALTH & WELLNESS

RENEWAIRE CORE TECHNOLOGY

CERTIFICATION
- Commercial Units: Certified by the Air Conditioning, Heating and Refrigeration Institute (AHRI) for an industry-leading, low-to-zero Exhaust Air Transfer Ratio (EATR) at typical static pressure differential
- Superior core flammability performance; passes UL-723 and UL-1812

MAINTENANCE
- RenewAire cores are easy to clean without removing them from the unit, and they never require washing

INNOVATIVE CONSTRUCTION
- Core exchanger material is cellulosic-based and doesn't contain or use halogenated flame retardants or PVCs
- Manufactured with a galvanized steel frame

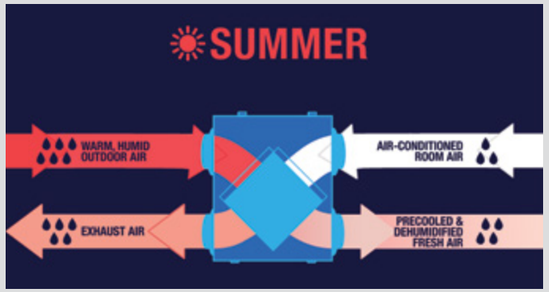
RELIABILITY
- An industry-leading 10-year structural and performance warranty for the static-plate core, two-year warranty for commercial products and five-year warranty for residential products

EXCEPTIONAL PERFORMANCE
- Moderates heat and humidity via total energy recovery to maintain a comfortable indoor environment
- No need for frost protection or condensate pans
- Laminar airflow ensures that particulates do not accumulate in the core

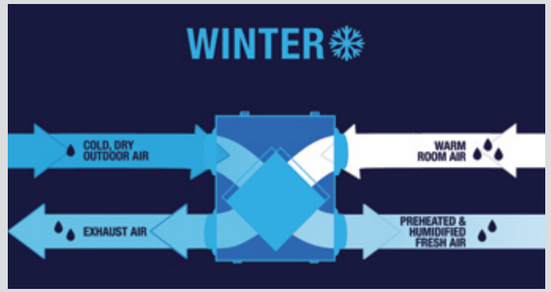
REDUCED COSTS
- Optimized energy efficiency via core energy transfer decreases ventilation energy requirements, which can result in smaller air conditioning and heating needs

RENEWAIRE ERVs TEMPER THE AIR

Our ERVs moderate the extremes of outdoor supply-air temperature and humidity year-round, providing a sustainable ventilation solution for every climate.



IN SUMMER, THE WARM, HUMID OUTSIDE AIR IS PRECOOLED AND DEHUMIDIFIED BY THE OUTGOING COOL INTERIOR AIR



IN WINTER, THE COLD, DRY OUTSIDE AIR IS PREHEATED AND HUMIDIFIED BY THE OUTGOING WARM INTERIOR AIR

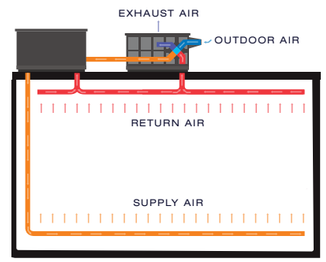
DN SERIES: DEDICATED OUTDOOR AIR SYSTEMS WITH ENERGY RECOVERY

DOAS: DECOUPLE OUTDOOR AND INDOOR AIR LOADS

Commercial buildings require outside air whenever a space is occupied to meet ventilation standards and maintain indoor air quality (IAQ). Incoming ventilation and make-up air typically account for **more than 80%** of a building's dehumidification load (ASHRAE).

Decoupling outdoor and indoor air load demand allows each system to operate independently and in parallel, which **reduces ventilation energy** use. This is possible via Dedicated Outdoor Air Systems (DOAS) that efficiently bring dehumidified outdoor air indoors to improve IAQ and thermal comfort.

A DOAS uses separate equipment to condition the outdoor air brought indoors for ventilation, and then delivers the air to each occupied space. This is done either directly or in conjunction with terminal or central HVAC units serving those same areas, which maintain space temperature. This process optimizes operational efficiency.



DEDICATED OUTDOOR AIR SYSTEM

BENEFITS OF DOAS

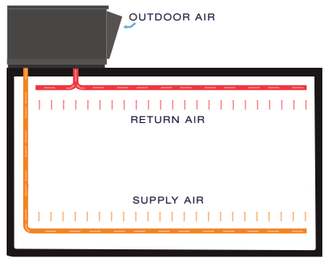
RenewAire's DOAS effectively conditions outdoor air with efficient and sustainable technology. By **enabling HVAC units to operate independently**, depending on building load, our DOAS unit with **fixed-plate energy recovery**, **cooling** and heating features and hot-gas reheat will optimize your ventilation strategy. The results are downsized equipment, decreased capital costs and significant operating savings.

There are many reasons to use DOAS, including some of the most common drivers:

- Improved humidity control
- Reduced energy consumption
- Decreased installation and energy costs
- Simplified ventilation design and control
- Maximized operational efficiency
- Ability to use heating and cooling systems that do not provide ventilation and/or dehumidification (e.g., radiant panels, chilled beams, VRF)

TRADITIONAL-DESIGN PROBLEMS AND DOAS SOLUTIONS

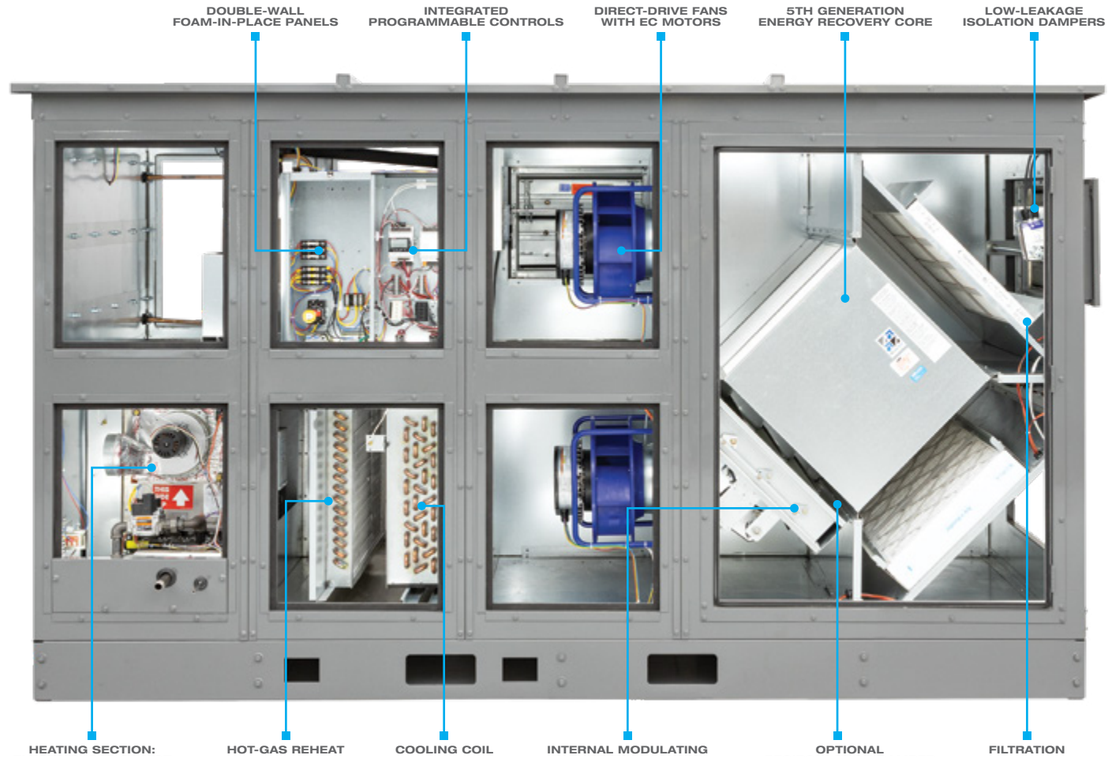
- **Terminal Systems:** Terminal systems, such as variable refrigerant flow (VRF) and chilled beam, can't handle the outdoor air's moisture load. DOAS can easily manage outdoor air load, allowing the terminal systems to manage the internal load.
- **VAV Systems:** Variable Air Volume (VAV) systems modulate airflow. Mixed air conditioning in central systems can't ensure that outdoor air will be supplied, which is how ventilation effectiveness is determined. DOAS solves this problem by providing a dedicated supply of 100% outdoor air.
- **Outdoor Air:** Today's designs require variable outdoor air, for which central systems may not have the capacity. DOAS can be designed to handle this variability.
- **Conventional Systems:** These systems do not decouple sensible and latent loads. Thus, since most of the latent load comes from the outdoor air, their operation to satisfy internal thermal loads can lead to high indoor humidity. DOAS can accommodate 100% of the latent load and a portion of the sensible load.
- **Site Installation:** A non-packaged DOAS (without integrated refrigeration and with remote condensers, called a split system) poses many challenges. It requires certified installation technicians, may leak, can be unreliable, needs considerable maintenance and generates high capital costs. A packaged DOAS with integrated refrigeration avoids these problems.



CONVENTIONAL HVAC SYSTEM

CODE REQUIREMENTS FOR ENERGY RECOVERY IN DOAS

Specific codes within **various regions call for DOAS-type products to deliver 100% outside air to each occupied space**. DOAS units incorporating energy recovery is a mandated feature for most code jurisdictions. ASHRAE standard 90.1 and IECC require a minimum of 50% of total effectiveness for the energy recovery component. Even when not mandated, it is one of the best ways to improve a building's energy efficiency.



VIEW LIFE SIZE VERSION OF DN3RT DOAS: **HTTPS://BIT.LY/3ZTJGFN**

GREEN BUILDING TRENDS

High-performance, green-building standards seek to reduce energy use and increase ventilation to improve health, wellness, IAQ and indoor environmental quality (IEQ). Sustainable design initiatives like ASHRAE Standard 189.1, LEED, 2030 Challenge, Living Building Challenge and WELL Building Standard have grown in popularity among architects, engineers, contractors and building owners alike.

RenewAire ventilation technologies create healthier and more comfortable indoor environments, while optimizing energy efficiency. This is done by reusing otherwise-wasted total energy from the exhaust air to condition incoming outdoor air. The results are exceptional IAQ, IEQ, energy reductions and cost savings.

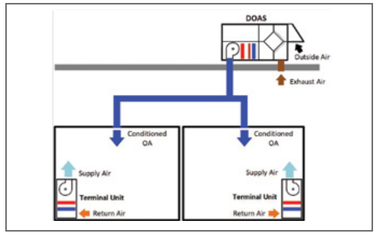
RENEWAIRE ERVs ARE THE SUSTAINABLE VENTILATION SOLUTION

DN MODELS AT A GLANCE

			DN2	DN3	DN5
UNIT	Airflow Range		375–1,650 CFM	750–3,300 CFM	1,125–4,950 CFM
	Installation Location		Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor
	Airflow Orientation		Vertical/Horizontal		
	Available Voltages		208–230V 1P (EC DN-2 only)/3P (all); 460V 3P (all); 575V (VFD only)		
	Unit Disconnect		Single-point connection/fused (optional)		
	Energy Recovery		RenewAire enthalpic static-plate G5		
	Internal Bypass of Energy Recovery		Yes, modulating bypass using face and bypass dampers		
CABINET	Wall Construction		1" or 2" double-wall, injected foam panels (2" optional)		
	Insulation		1" R-6.5/2" R-13.0		
	Panels with Thermal Break		Available on 2" double-wall units		
	Painted Cabinets		2,500-hour salt spray rated in white, grey or custom (optional)		
	Isolation Dampers		Low-leakage Class I dampers		
SUPPLY/EXHAUST FAN	Supply Blower		High-efficiency plenum fans		
	Supply Fan Type		Direct-drive		
	Supply Fan Speed Control		ECM/VFD (optional)		
	Supply Fan Vibration Isolation		Neoprene/spring (VFD only)		
	Supply/Exhaust Fan Motor HP (kW)	200-277V 1P	1.35 kW	N/A	N/A
		200-240V 3P	2.70 kW	2.70 kW	2.70 kW x2
		380-480V 3P	3.70 kW	3.70 kW	3.70 kW x2
		575V 3P	3 HP	5 HP	5 HP x2
		VFD	3 HP	5 HP	5 HP x2
	Unit ESP		2" WC at 1,500 CFM	2.5" WC at 3,000 CFM	3" WC at 4,500 CFM
COOLING/ HEATING	Cooling Section		Direct expansion (R410a, R454b, or R32 DX coil), chilled water, heat pump (optional)		
	Heating Section		Electric heat (SCR), indirect gas furnace (5:1, 10:1 modulation), hot water, heat pump, steam (optional)		
	Hot-Gas Reheat		Modulating (optional)		
CONTROLS	Economizer/Defrost Capability		Modulating		
	Microprocessor Controller		Integrated programmable controller		
	Control Hardware		Carel c.pCO mini		
	Optional Communications		BACnet MS/TP or IP, Modbus RTU or TCP		
	Airflow Monitoring		Yes		
	Recirculation Mode		Yes (optional)		
OPTIONS	GFCI Convenience Outlet		120 VAC, 20A (field powered)		
	Roof Curbs		14" height		
	Seismic and Wind-Rated Curbs		Yes		
	MERV 8 (2" only), 13 and 14 Filters		Available in 2" and 4"		
	Mist Eliminator		3/8"		
	Drain-Overflow Switch		Yes		
	Coil Coatings		Yes		
Certifications			For Core: AHRI CERTIFIED		For Unit: ETL Intertek

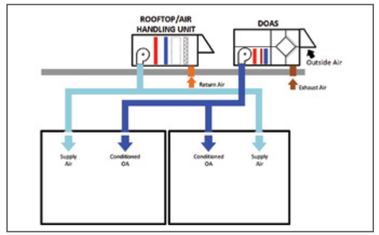
APPLICATION STRATEGIES

DOAS DIRECT TO ZONE WITH TERMINAL UNITS

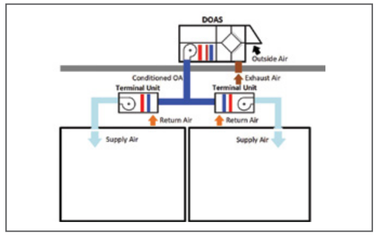


- Variable refrigerant flow/volume
- Fan coils
- Heat pumps
- Chilled beam
- Radiant floor heating and cooling
- Packaged terminal air conditioning

DOAS DIRECT TO ZONE WITH ROOFTOP/CENTRAL AHU

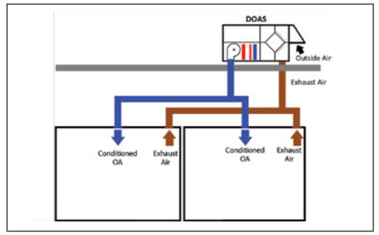


DOAS AIR SUPPLIED TO INTAKES OF TERMINAL UNITS



- Variable refrigerant flow/volume
- Fan coils
- Active chilled beam

DOAS 100% OUTDOOR AIR



- Designed for high-performing buildings
- DOAS handles external and internal loads with low dew point supply conditions
- Designed for high-performing buildings
- DOAS handles external and internal loads with low dew point supply conditions
- No recirculation units
- Lower capital costs, lower installed costs and lower operating costs

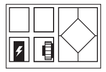
MAINTENANCE IS SIMPLE

Disposable filters should be checked and replaced as needed. Additionally, once a year, vacuum the four core faces using a soft brush. The RenewAire core does not need to be washed as particulates do not accumulate in the core.

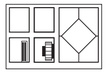
MODULAR DESIGNS

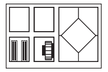
ERV - Energy Recovery Ventilator
EH - Electric Heater
CC - Cooling Coil
HC - Heating Coil
GH - Gas-Heat Module
HGRH - Hot-Gas Reheat Coil
BT - Blow Thru
DT - Draw Thru


ERV ONLY


ERV + EH (BT)


ERV + GH (BT)


ERV + CC/HC (BT)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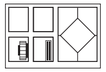
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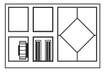
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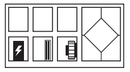
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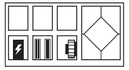
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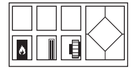
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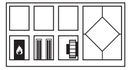
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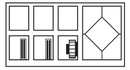
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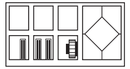
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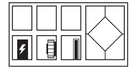
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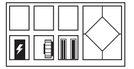
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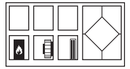
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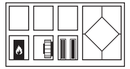
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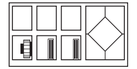
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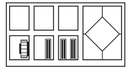

ERV + CC + HGRH + HC (DT)

RenewAire supports the

PILLARS OF SUSTAINABILITY

PEOPLE

Reduce acute and chronic health problems

Improve alertness and cognitive function

Boost productivity

PLANET

Committed to green manufacturing since 1982

Protect the environment with less energy use

Achieve a green structure with greater energy efficiency

PROFIT

Can benefit from a short payback period

Realize annual energy savings

Trouble-free operations and maintenance

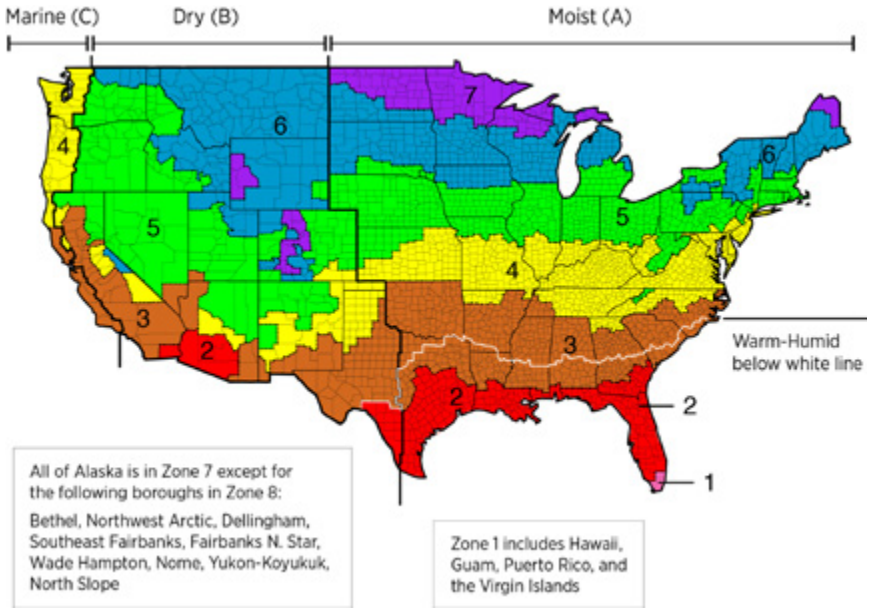
WHY **ENERGY RECOVERY IS CRITICAL**

DECARBONIZATION AND ENERGY EFFICIENCY DEMANDS

The **main responsibility of a 100% outdoor air unit is to dehumidify** the incoming air. In this process, the system inherently handles large heating and cooling loads. Adding energy recovery significantly minimizes these loads and the HVAC equipment required to condition the air.

ASHRAE 90.1-2010 requires the use of energy recovery based upon a unit's supply airflow, outdoor air percentage, geographic location and hours of operation. The standard mandates the total effectiveness (sensible and latent) by a minimum of 50% when required.

The effectiveness of energy recovery devices varies depending on the type, material and airflow balance. This value is determined based on the test procedure outlined in the Air Conditioning, Heating and Refrigeration Institute's (AHRI) Standard 1060.



Map courtesy of International Code Council

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

RENEWAIRE VENTILATION SOLUTIONS INCREASE MONETARY BENEFITS

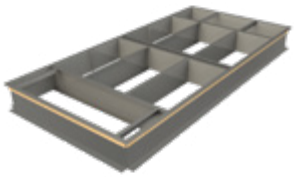
ACCESSORIES

HEATERS

EK Series Electric Duct Heater
(for indoor units only)

CURBS AND CURB CLIPS

Curb Clip Kit



Roof Curbs

FILTERS

2" or 4" MERV 13, 14 Filters

CONTROLS

CO2 Sensor Wall Mount

IAQ Sensor Wall Mount

CO2 Sensor Duct Mount

IAQ Sensor Duct Mount

Temperature Sensor Duct Mount

Room Temperature & Humidity Sensor

Occupancy Sensor Ceiling Mount

Occupancy Sensor Wall Mount

Duct Static Pressure Sensor Wall/Duct Mount without Display

Duct Static Pressure Sensor Wall/Duct Mount with Display

Smoke Detector Duct Mount

Remote Display Handheld or Wall Mount

COIL ACCESSORIES

Waterless Trap Negative Pressure

Waterless Trap Positive Pressure