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
- Indoor/Outdoor (outdoor available with Packaged Refrigeration)
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 makeup 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.

OPTIMIZE OPERATIONAL EFFICIENCY WITH DOAS

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.

BENEFITS OF DOAS

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)

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.

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 CORE TECHNOLOGY

CERTIFICATION
- 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 differentials
- 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 cellulose-based and doesn’t contain or hold 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.

A PACKAGED DOAS IS BETTER

A DOAS configured with integrated refrigeration and a condenser is a packaged system, which is built in a controlled manufacturing facility. It offers many benefits over non-packaged options, including:

- More rigorous and environmentally sound management of refrigerants
- More efficient to build
- Easier and less costly to install
- Less space used
- Simpler to start up, commission and maintain
- A single source for warranty information and quality assurance

TRADITIONAL-DESIGN PROBLEMS & 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.

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
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, innovative packaged refrigeration/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.

A CLOSER LOOK
Ventilation can enhance IAQ and decrease the transmission of airborne infectious diseases, including COVID-19: https://bit.ly/COVID19_WP

WHY ENERGY RECOVERY IS CRITICAL
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.

<table>
<thead>
<tr>
<th>ZONE</th>
<th>PERCENTAGE OF OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30% ≤ 40%</td>
</tr>
<tr>
<td>3B, 3C, 4B, 4C, 5B</td>
<td>NR</td>
</tr>
<tr>
<td>1B, 2B, 5C, 6B</td>
<td>NR</td>
</tr>
<tr>
<td>6B</td>
<td>≥ 11,000</td>
</tr>
<tr>
<td>1A, 2A, 3A, 4A, 5A, 6A</td>
<td>≥ 5,500</td>
</tr>
<tr>
<td>7, 8</td>
<td>≥ 2,500</td>
</tr>
</tbody>
</table>

Map courtesy of International Code Council


### DN MODELS AT A GLANCE

<table>
<thead>
<tr>
<th>DN2</th>
<th>DN3</th>
<th>DN5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airflow Range</strong></td>
<td>0.5-2.5</td>
<td>0.5-2.5</td>
</tr>
<tr>
<td><strong>Refrigeration Capacity (Packaged only)</strong></td>
<td>2-10 tons</td>
<td>3.5-20 tons</td>
</tr>
<tr>
<td><strong>Installation Location</strong></td>
<td>Indoor/Outdoor</td>
<td>Indoor/Outdoor</td>
</tr>
<tr>
<td><strong>Airflow Orientation</strong></td>
<td>Vertical/Horizontal</td>
<td>Vertical/Horizontal</td>
</tr>
<tr>
<td><strong>Available Voltages</strong></td>
<td>208-230V 1P (EC DN-2 only)/3P (all); 460V 3P (all); 575V (VFD only)</td>
<td>208-230V 1P (EC DN-2 only)/3P (all); 460V 3P (all); 575V (VFD only)</td>
</tr>
<tr>
<td><strong>Unit Disconnect</strong></td>
<td>Single-point connection/fused (optional)</td>
<td>Single-point connection/fused (optional)</td>
</tr>
<tr>
<td><strong>Energy Recovery</strong></td>
<td>RenewAire enthalpic static-plate G5</td>
<td>RenewAire enthalpic static-plate G5</td>
</tr>
<tr>
<td><strong>Theoretical ISMRE</strong></td>
<td>44°F/44°F</td>
<td>44°F/44°F</td>
</tr>
<tr>
<td><strong>Internal Bypass of Energy Recovery</strong></td>
<td>Yes, modulating bypass using face and bypass dampers</td>
<td>Yes, modulating bypass using face and bypass dampers</td>
</tr>
</tbody>
</table>

### MODULAR DESIGNS

- **ERV** = Energy Recovery Ventilator
- **E** = Electric heater
- **C/C** = Cooling Coil
- **H/C** = Heating Coil
- **G** = Gas Heater Module
- **H/G** = Hot-Gas Reheat Coil
- **D** = Direct Expansion
- **B** = Blower Only
- **S** = Standard housing
- **B** = Blower Only
- **D** = Direct Expansion
- **B** = Blower Only
- **D** = Direct Expansion

#### ERV + E/C/H/G + DX

#### ERV + C+C/DX + H/G + EH

#### ERV + C+C/DX + H/G + HC

#### ERV + C+C/DX + H/G + GH

### APPLICATION STRATEGIES

#### TERMINAL-UNIT SYSTEMS

- **DOAS DIRECT TO ZONE WITH TERMINAL UNITS**
  - Variable refrigerant flow/volume
  - Fan coils
  - Heat pumps
  - Outdoor units
  - Designed for high-performing buildings
  - Modular unit design
  - Energy efficient design

- **DOAS AIR SUPPLIED TO INTAKES OF TERMINAL UNITS**
  - Variable refrigerant flow/volume
  - Fan coils
  - Active chilled beam
  - Heat pumps
  - Outdoor units
  - Designed for high-performing buildings
  - Modular unit design
  - Energy efficient design

- **DOAS 100% OUTDOOR AIR**
  - Variable refrigerant flow/volume
  - Fan coils
  - Active chilled beam
  - Heat pumps
  - Outdoor units
  - Designed for high-performing buildings
  - Modular unit design
  - Energy efficient design
**APPLICATION STRATEGIES**
**TERMINAL-UNIT SYSTEMS**

**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 AIR SUPPLIED TO INTAKES OF TERMINAL UNITS**
- Variable refrigerant flow/volume
- Fan coils
- Active chilled beam

**DOAS DIRECT TO ZONE WITH ROOFTOP/CENTRAL AHU**

**DOAS 100% OUTDOOR AIR**
- 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

ROOFTOP APPLICATIONS SHOWN, CONFIGURATION CAN BE APPLIED TO INDOOR UNITS
REFRIGERATION COMPONENTS

SINGLE CIRCUIT WITH HOT-GAS REHEAT

SINGLE CIRCUIT WITHOUT HOT-GAS REHEAT

SECOND CIRCUIT IN A TWO-CIRCUIT ARRANGEMENT
ACCESSORIES

HEATERS
- EK Series Electric Duct Heater (for indoor units only)

CURBS AND CURB CLIPS
- Curb Clip Kit
- Roof Curbs
- 2” or 4” MERV 13, 14 Filters

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

RenewAire.com
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