

AEROSEAL Certified Duct Diagnostics and Sealing



Turn to the Experts.™



Revolutionary Technology from Carrier

Recover Lost Energy From Where You'd Least Expect It... Your Ductwork.

Whether you're aware of it or not, your HVAC system's ductwork is probably leaking. And if you're responsible for finding ways to reduce your building's energy costs, improve IAQ and extend your system's equipment life, you might want to start by taking a closer look at your ducts.

The reality is that most ductwork leaks, even brand new systems. A recent survey by the U.S. Department of Energy cites the Lawrence Berkeley National Laboratory study which found that the leakage rates of commercial buildings, on average, exceed the ASHRAE recommended leakage classes by roughly a factor of 20!

More specifically, this research found that, as a group, commercial buildings have a tendency to exhibit duct

system problems such as inferior workmanship, inadequately supported ductwork, torn and missing external duct wrap, and improperly installed duct sealants. Additionally, thermal, pressure and temperature cycling can damage sealants — especially the rubber-based adhesive found in duct tape — increasing leakage over time.

To help combat energy and equipment-repair costs resulting from leaking ductwork,

Carrier offers commercial building owners and managers the most advanced duct sealing in the industry...

AEROSEAL™.

AEROSEAL is a patented air duct sealing technology that is the most effective, affordable and viable method of sealing ductwork systems within commercial buildings. It seals leaks in the air distribution ducts by injecting a fog of aerosolized sealant particles into a pressurized duct system. The particles stay suspended within the air stream and are not deposited on the duct surfaces until they reach the leaks. As the air stream makes a sharp turn to exit through any leak, the particles skid out and smash onto the leak edges and build up to span and seal the holes, up to 5/8 of an inch, without coating the ductwork.

The **AEROSEAL** duct sealing system effectively seals ductwork from the inside out by using UL tested and approved sealing material. It's clean, safe and guaranteed for 10 years. The **AEROSEAL** process won the "Best of What's New" award from Popular Science and the "Energy 100" award from the U.S. Department of Energy. In 2000, the U.S. DOE also rated the **AEROSEAL** duct sealing process as one of the 23 most beneficial technologies available to American consumers to come out of DOE's 23 years of existence.



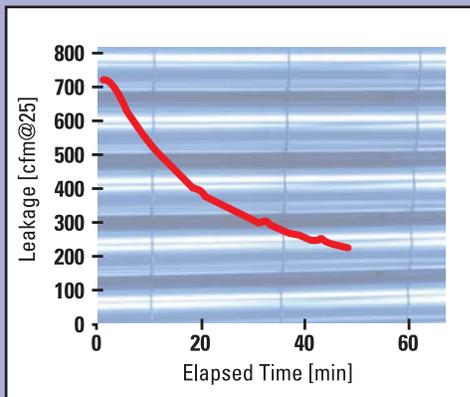
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The primary benefit from having tight duct systems is reduced electricity use.

Duct Leakage Testing

With the system fan running under normal operating conditions, we will perform a fan pressurization test of the duct system, or a comparison of system and grilles flows. Quite often in either large or small commercial buildings, these supply and return leaks can be excessive and may have been with the building since it was built.

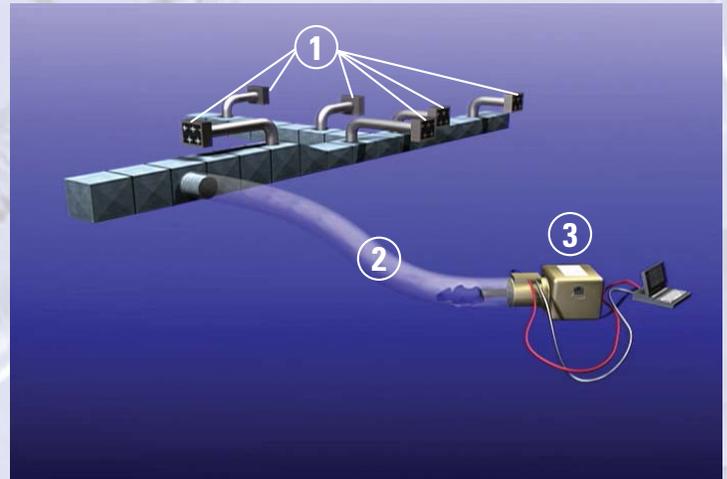


Improved Indoor Air Quality

Tight duct systems in commercial buildings reduce entry of dust, contaminants and excess humidity. For example, well sealed ducts can reduce the spread of airborne germs in hospitals and chemicals in manufacturing facilities.



How AEROS



Carrier's AEROS^{SEAL} process begins by conducting a thorough diagnostic test of your duct system. Once the Duct Leak Analysis is completed and approved, all Supply and Return grilles are temporarily sealed (1, above). Next, the patented duct sealing equipment blows small, dry adhesive particles into your ducts (2). To maintain uniform adhesive flow rates, a computer-monitored fan continually suspends particles in the airflow through a patented nozzle system (3). As the particle-infused air stream turns sharply by being forced through the leaks, particles collide with each other as well as the leak edges. As the process continues, AEROS^{SEAL}'s adhesive continues to build up on the edges of the holes until the leaks are sealed.

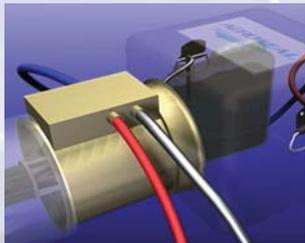
AEROS^{SEAL} — Revolutionary Technology from Carrier

From the moment they initiate their analysis to uncover supply and return duct leakage within your building, our technicians are reflective of the high level of professionalism and technical expertise that you can always expect from Carrier.

While our world-class equipment and systems are designed to deliver unparalleled performance and energy-savings in commercial applications, Carrier's AEROS^{SEAL} technology represents a revolutionary step, which could significantly reduce energy consumption throughout the world.

At Carrier, we view your building holistically, not just from an HVAC equipment perspective. This allows us to recommend the types of solutions designed to help contain energy costs without sacrificing individualized comfort.

EAL Works...



A. During the sealing process, AEROSEAL's patented equipment is continually monitored and controlled to ensure an efficient flow of adhesive to your ductwork.



B. Small vinyl polymer aerosol particles are kept suspended in the airflow by a continuous air movement.



C. The suspended adhesive particles continue on their journey throughout your ducts without clinging to the solid walls.



D. As the adhesive-infused air stream makes a sharp turn to exit through any leak, the particles skid out and smash onto the leak edges, building up to span and seal the leaks.



E. As the process continues, AEROSEAL's adhesive continues to build up on edges of holes...



F. until the entire leak is sealed.

Management Tools for a Sound Financial Decision

After the initial duct leakage analysis is performed on your building, Carrier experts



can accurately illustrate the financial benefits that duct sealing can have on your company's bottom line. Using local utility rates, estimated system operating hours and

other inputs supplied by your operations personnel, our software closely calculates all the financial parameters of the project including: simple payback, benefit to cost ratio and return on investment (ROI).

Results will depend on a number of factors including: the initial duct leakage level, your local utility rates and demand charges (if applicable), utility rebates (if available) as



well as the configuration and operating methods of your HVAC system.

Example 1

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Program for Aerosol Duct Sealing - LARGE Commercial

Customer: [Redacted]
Building: [Redacted]
Location: [Redacted]

Office Type: [Redacted]
MTO: [Redacted]
Contractor: [Redacted]

1) Big Size Total Supply
1st floor 100 ft²
2nd floor 100 ft²
MTO systems 4 more floors
CFM per sq ft 8
CFM per sq ft 8

2) Fan Power watts per CFM
1.18

3) VFD Outside Fan? [Redacted]

4) Operating Hours
[Redacted]

5) Energy/Labor Provider
Rate or Provider [Redacted]
Merrill Demand Charge \$/kW peak [Redacted]

6) Fan Energy Usage
Annual Fan Energy Cost with VFD [Redacted]
Annual Fan Energy Cost with VFD [Redacted]
Annual Fan Demand Cost [Redacted]
Leakage Rate [Redacted]
Leakage Rate [Redacted]
Leakage Rate [Redacted]

7) Fan Power Savings
11) Fan Power Savings [Redacted]
12) Fan Power Savings [Redacted]
13) Fan Power Savings [Redacted]
14) Fan Power Savings [Redacted]
15) Fan Power Savings [Redacted]
16) Fan Power Savings [Redacted]

17) TOTAL ANNUAL SAVINGS
Proposed Return on Investment [Redacted]

18) Payback & Cost Considerations
19) Payback & Cost Considerations [Redacted]
20) Payback & Cost Considerations [Redacted]
21) Payback & Cost Considerations [Redacted]
22) Payback & Cost Considerations [Redacted]
23) Payback & Cost Considerations [Redacted]
24) Payback & Cost Considerations [Redacted]

25) ROI Payback Estimate, and Value of Sealing
Simple Payback with rebate [Redacted]
Simple Payback with rebate [Redacted]
Simple Payback with rebate [Redacted]
Benefit to Cost Ratio with rebate [Redacted]
Benefit to Cost Ratio with rebate [Redacted]
ROI with rebate [Redacted]
ROI with rebate [Redacted]

26) Calculation of Cooling Savings from Eliminated Power (Table 7)
with rebate w rebate 450 [Redacted]
w rebate w rebate 206 [Redacted]
w rebate w rebate 206 [Redacted]

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• Save Energy While Improving Comfort and Safety
• Reduce Fan Power
• Cut Peak Electricity Demand
• Reduce Packaged HVAC

Leaky Ducts Are Costing You Money!

Many factors can contribute to ductwork degradation. While duct leakage can often be directly proportional to the quality of the original installer, the combination of time, vibration and moisture will have negative effects as well. Retrofit modifications or sensor removal without proper sealing will also cause leaks.

Here's just a few of the negative effects that leaky ducts can have on commercial buildings:

Increased Energy Consumption

As the system increases fan speed to compensate for duct leakage, additional energy is being used. Adding 15% duct leakage at operating conditions leads to an increase in system fan power between 25 and 35%. And with fan power representing



30 – 50% of HVAC energy usage in large commercial buildings, these costs can be significant.

Thermal Loss

As supply air escapes, it will cause variations in temperature between rooms, negatively affecting the comfort of those in the conditioned space.



Excessive Equipment Usage

To compensate for the loss in pressure and temperature accuracy, equipment components must run longer than originally specified. Over time, this could lead to increased maintenance or replacement costs.

Airflow Safety

For hospitals, laboratories and manufacturing facilities, the unexpected spread of contaminants and biohazards could pose a real liability as a result of leaking ductwork.



For every minute that your building's HVAC system is operating, duct leakage is affecting a variety of conditions and costing you money.

AEROSEAL Features and Benefits

| | |
|---|--|
| Seals holes up to 5/8" | Reduces energy consumption / Improves comfort and safety / Corrects most substandard ductwork and degradation |
| Procedure executed during off-hours or weekends | No disruption of work environment |
| 10+ year protection | Attractive payback and peace of mind |
| Patented technology | Guaranteed, documented sealing / Reaches otherwise inaccessible leaks / Severely reduces uncontrolled airflows |
| Minimizes uncontrolled airflows | Reduces costs associated with contaminant spread and clean-up |
| Sealant does not coat ducts | Efficient sealant usage |
| Sealant remains pliable | Not affected by vibration, humidity or temperature |
| Vinyl polymer sealant | Safe / No odors or off gassing supports IAQ strategies |

Turn to the Experts.

Whatever your HVAC needs, from specifying and purchasing to installation and maintenance, Carrier has the solution. As the world leader in heating, ventilation and air conditioning, Carrier is committed to continually improving the quality of comfort for our customers. From concept to finished product, your local Carrier sales representatives walk with you every step of the way. Whether you have one building, multiple sites nationwide or special equipment and facility requirements, Carrier sales representatives will recommend a solution that fits your scope and your budget.



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