ADDENDUM

SecureAire Residential Air Purification System Application Guidelines

This document will provide important information regarding the application and installation of SecureAire's Platinum Air Purification System. How the device is integrated with the HVAC air handling system is as important as the product itself and the Authorized Dealer agrees to follow these guidelines.

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Why is Proper Airflow Important?

Proper airflow is arguably the most important consideration when designing a heating and cooling system. It is essential for optimum energy efficiency, comfort, heating and cooling equipment longevity and certainly for indoor air quality considerations.

Air conditioners typically need to have between 350 cfm/ton (humid climates) and 450 cfm/ton (dry climates) for optimum operation. High efficiency 90%+ furnaces typically need 150 cfm per 10,000 BTUs of input, mid-efficiency furnaces typically need 130 per 10,000 BTU's of input.

Any air cleaning device placed into the central furnace or air handler's air stream will cause some added resistance to airflow. While the SecureAire System is one of the least resistant air cleaners on the market, it is no exception.

This situation is complicated by the possibility that a client's duct system already has pre-existing challenges and may already have lower than recommended airflow. Multiple industry studies have determined that lower than recommended airflow is a chronic problem. The most common causes of low total system airflow are undersized return inlets and ducts, inefficient fittings, dirty equipment, incorrect blower settings, and excessively resistant or dirty air filtration.

On the other hand, a client may have been using a different air filtration device which has greater resistance to airflow than the SecureAire System (for example one-inch MERV 12 pleated filters available at big box stores) and the new SecureAire will cause less resistance and result in more airflow.

Energy Star and other studies have determined that lower-than-recommended airflow is a chronic problem with existing systems. https://tinyurl.com/y5xj78aw p.20. The most common causes of low total system airflow are undersized returns, inadequate supplies, poor duct design, poor duct installation, crushed ductwork, inefficient fittings, dirty blowers or coils, incorrect blower settings, highly restrictive air filters and/or excessively dirty air filters.

In the interests of optimum customer service and product satisfaction, reduced call-backs and enhanced dealer/ SecureAire reputation, SecureAire recommends all dealers become proficient at diagnosing pre-existing airflow issues, predicting the effect on airflow of the SecureAire System, and at offering and implementing the advanced airflow upgrades described here as appropriate.

Educating the client about the benefits of additional duct modifications and offering choices is good ethical sales practice. If they invest in the recommendations, it achieves the triple benefits of increased customer satisfaction, reduced callbacks and increased revenue. If they do not, you have at least informed them in advance of possible side effects and reduced your warranty exposure.

SecureAire Recommended Airflow Considerations

For optimum air treatment performance, with minimal negative impact on system airflow, the following installation best-practice guidelines should always be followed when installing a SecureAire Whole Home Air Purification System:

Manufacturer Design Airflow Standards

All heating and air conditioning equipment is designed by the manufacturer to deliver a specific amount of airflow. The manufacturer includes a properly sized blower to provide that airflow after overcoming the static pressure of the return and supply ductwork, the air conditioner evaporator coil and the filter. The most common designs are set to overcome 0.5 in wc. of static pressure and still provide the design airflow. The allowances for each component are:

- 0.1 in wc for the supply ductwork
- 0.1 in wc for the return ductwork
- 0.2 in wc for the evaporator coil
- 0.1 in wc for the filter

The Impact of Leaky and Undersized Return Air Ductwork on Indoor Air Quality

Undersized and leaky return air ductwork is very common in existing homes. The air handler's blower is designed to provide a specific volume of air to the supply duct system and the same amount of air is required to come back to the furnace or air conditioner through the return air system. When the return air is undersized (and/or if the filter is restrictive, and/or if the blower wheel is dirty, and/or if the evaporator coil is clogged), then the resulting negative pressure on the return air system will pull air in from wherever it can, often drawing in air from unconditioned and/or dirty places. This can include crawl spaces, attics, wall cavities and the like. This unconditioned air is often too hot or too cold, too moist or too dry, and certainly too dirty. Also, dust from insulation particles or smells from damp spaces could aggravate asthma and allergy problems.

Adding any required return air ductwork, and sealing ducts, can significantly improve indoor air quality by reducing the risks of pollutants entering the ductwork and circulating through your home.

Duct Sealing with Energy Star®
https://www.energystar.gov/sites/default/files/asset/document/ES_Duct_Sealing_flyer.pdf

Select Largest Possible SecureAire Cabinet

In general, select the largest SecureAire System cabinet which can be reasonably accommodated. The more surface area the air can pass through, the less resistance to airflow from the filter. For example, while a nominal 3-ton 1200 cfm system could accommodate the 16x20 ACS1620-PLT model, if the 20x20 ACS2020-PLT model will fit, the initial pressure drop created at 1200 cfm will be 20% lower

Smooth Transitions

If the return air duct or furnace openings do not fit the SecureAire System cabinet openings, gradual transitions are recommended to reduce air turbulence and maximize efficiency. No more than 45 degrees (about 8.5 in. per running ft.) of expansion should be used on each side of the transition fitting. A more gradual 30 degrees (12 inches rise per foot of run) is even better if achievable on the air entering side.

Install Turning Vanes (or Rounded Throat and Heel Elbow)

If the SecureAire System is installed adjacent to a 90-degree return duct elbow (or perpendicularly into a box return plenum right at the furnace/air handler), metal turning vanes should be added inside the elbow or plenum to improve air distribution across the face of the filter, reduce air turbulence and decrease airflow resistance. In some cases a replacement rounded throat and heel elbow will achieve similar results

Seal Duct/SecureAire/Furnace Connections

The connection between the SecureAire System discharge and the furnace or air handler inlet should be sealed, using a suitable sealant such as foil tape, mastic or silicone caulking. This helps prevent dust and contaminants from bypassing the filter which would add additional contaminants into the ductwork and into the living space.

Additional sealing of all duct leaks elsewhere in the system starting where the SecureAire connects to the duct system is a good practice in order to reduce infiltrated dust and contaminants.

Clean Blower Wheel, Indoor Coil, and 90%+ Furnace Secondary Heat Exchanger

Any dirty internal equipment components which would restrict airflow or release pre-existing contaminants into the airstream downstream of the SecureAire System should be inspected and cleaned if needed.

Confirm Correct Blower Speed Settings

With ECM technology, the airflow settings (e.g. DIP switches) should be double checked and if needed corrected to achieve 350 to 400 cfm/ton (humid climates) or 400 to 450 cfm/ton (dry climates). With PSC motors, the correct fan speed tap must be selected for the correct airflow and checked against the resulting total external static pressure (more details below).

Inspect for Existing Return Air Inlet Obstructions

Find all the return air inlet grilles and ensure they are not obstructed by rugs, furniture, shaggy dogs, stacks of newspaper or other household possessions. Advise the homeowner of the need to keep them unrestricted.

Consider Replacing Excessively Restrictive Registers and Grilles

Many existing supply registers are highly-restrictive to airflow and can be replaced with bar-type product that can improve airflow by 20-30% or more. For example, you might be 20-30 cfm more from a bar-type register compared to a typical stamped registers or decorative registers. This can easily add up to a half-ton of supply airflow in a typical home.

Consider Two Units on Large Systems

While not always necessary, on nominal 4 and 5-ton systems, improved airflow performance and longer time between filter changes will be obtained if the installation can accommodate two SecureAire units, installed in parallel, thereby splitting the air flow paths into the furnace or air handler. For example, if the airflow on a 2000 cfm 5-ton system is split into two SecureAire 20x25 units at 1000 cfm each, the total initial air cleaner pressure drop will be 58% lower

Troubleshooting Problems Caused by Inadequate Airflow

The following table reviews the possible negative side effects of inadequate airflow, as well as the benefits of duct modifications and airflow adjustments insure proper airflow.

Most of the following possible negative outcomes will occur if the HVAC system already had low airflow issues prior to the SecureAire installation. These problems may also occur if the filter is not changed when needed and the filter has become excessively restrictive.

Possible Negative Side Effects and Benefits

Possible Negative Outcome of Lower Airflow	Benefits of Resolving Pre-Existing Airflow Issues when Properly Installing SecureAire	Explanation
"Furnace now cycles on high limit."	Furnace operates normally in response to thermostat.	Low airflow causes a rise in the heat exchanger internal temperature and will result in the heat exchanger high limit control locking out on safety.
"Heat exchanger cracked."	Furnace heat exchanger lasts for expected normal life.	Excessive temperature rise leads to increased expansion and contraction of the furnace heat exchanger and shorter life.
"Inducer fan overheated and failed prematurely."	Inducer fan lasts for expected normal life.	Low airflow leads to excessively hot combustion gases, which can cause the inducer fan to overheat and fail.
"Coil now freezes up."	Coil does not freeze up.	Low airflow increases temperature drop across the indoor coil to become excessive, causing a colder than normal coil surface and the condensate can eventually turn into ice.

"AC compressor slugged and died."	AC compressor lasts for normal life.	An excessively cold indoor coil can lead to partial refrigerant flashing and liquid refrigerant returning to the compressor, potentially causing damage.
"Ducts are now sweating."	Ducts don't sweat.	Low AC airflow is colder airflow, which leads to colder external supply duct surface temperatures, increasing the likelihood that airborne humidity in the duct zone will condense on the exterior surface of the ducts or diffusers.
"AC can no longer keep up"	AC has full output.	Low airflow reduces total AC output (to a greater degree in dry climates than humid).
"Airflow has dropped way off in my master bedroom" "House just feels kind of sticky and stagnant"	Balanced, well mixed comfortable airflow.	Low airflow leads to greater conductive heat gain, lower velocities and warmer AC air leaving the registers, and less breaking up of stagnant air.
"Variable speed motor is now screaming noisy running at max RPM"	Motor noise is normal.	High airflow resistance causes higher static pressures, causing EC motors to ramp up to a higher, noisier RPM.
"Variable speed motor module died"	Motor module lasts for expected normal life.	If the RPMs consistently are above spec, the motor electronic module is stressed and more likely to fail prematurely.
"Electric bill went up"	Electric bill unaffected, or decreases.	High motor ECM RPMs lead to higher watt draw. Poor mixing leads to occupants excessively lowering (summer) or raising (winter) thermostat settings, leading to greater fuel consumption.

Other General Benefits of Reducing Static Pressure and Improving Airflow

In addition to the above, after a duct renovation the following benefits are often realized by the customer:

Quieter Fan Operation: Lower static pressure allows the indoor fan motor to move the programmed airflow at a lower speed, which is quieter.

Save Money with Variable Speed Motors: lower RPMs equals lower watt draw, which reduces both motor electrical consumption and air conditioning load.

Less Return Air Grille Inlet and Return Duct Air Noise: If the return duct network is enlarged, the average velocity of the air moving through the grilles and ducts is slower and therefore quieter.

More Comfort: less restrictive ductwork and filtration will allow conditioned air to reach even the furthest rooms, providing more comfort throughout the home.

Save Money on Furnace and AC Operation: Proper airflow as designed by the equipment manufacturer will insure the manufacturer's rated system efficiency is achieved, reducing utility overpayments and saving money.

Improved Health: Inadequate return air combined with leaky ductwork will suck unconditioned air into the ductwork, resulting in additional particulates, pathogens and VOCs entering the home. With proper design and installation, this problem is avoided, providing for a healthier indoor environment.