

The Relationship Between Ductwork and IAQ

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One of the most popular training and certification classifications today in the HVAC field is indoor air quality (IAQ).

The trend in IAQ service technician training is increasing equivalently with the rise of mold and other biological contaminants incidents found in not only HVAC equipment but also residential ductwork across the U.S. Cleaning mold from metal ductwork requires proper techniques, while duct board infested with mold must be replaced, therefore what better source is there for rectifying IAQ problems than HVAC contractors?

For the contractor with a ductwork fabrication/installation specialty, IAQ services can not only increase business, but also provide an enhanced health service that carries a perceived value that many customers are willing to purchase. Many HVAC service contractors see the IAQ niche as a new profitable business model that separates them from the cutthroat business of \$49.95 a/c and furnace repair. IAQ starts and ends with the air conditioning (a/c) system, therefore it's the qualified HVAC service contractor that should make indoor air improvements, not trades such as duct vacuuming services or mold specialists. Assuming there are no water leaks, mold is almost always developed by condensation produced by the air conditioning system. Contrarily, controlling humidity with the air conditioning system will prevent condensation and the resultant mold growth. Therefore IAQ problems start and end with the air conditioner, which should be the realm of only the HVAC service contractor.

Consequently, the IAQ market is ripe for picking from any innovative contractor. Over 20 million Americans, including 6.3 million children now suffer asthmatic conditions today. This rise in respiratory problems is aligned with the construction industry's quest for tighter, higher efficiency construction techniques that prevent homes from "breathing." Therefore the growth of airborne contaminants such as mold/mildew and the off-gassing of today's new synthetic building materials become trapped indoors.

IAQ training is key because unskilled IAQ services can actually exacerbate the problem when improper techniques are applied, especially with ductwork. For example, even though duct cleaning remains popular, the Environmental Protection Agency's (EPA) website (www.epa.gov/iaq/pubs/airduct.html) states "duct cleaning has never been shown to actually prevent health problems" and specifically warns that improper cleaning can exacerbate IAQ problems by stirring up and distributing airborne contaminants throughout the house. Likewise, the common remedy of putting bleach cleaner on mold located in or near the HVAC's air stream is not recommended, either. Bleach kills mold, however it creates microscopic pieces of airborne acids that can result in severe respiratory problems.

Becoming an IAQ service contractor is a natural extension of a/c service practices because it employs many of the same principles contractors already use. Many manufacturers offer IAQ training courses. A free IAQ training manual is available at www.epatest.com/IAQ/manual/manual.jsp and free online training software is downloadable from www.epatest.com/software. The fact that more contractors downloaded this program last March than any previous month is proof IAQ training's popularity is escalating.

The incidence of mold is good news for service contractors and bad news for consumers. Left alone, mold propagates inside the HVAC equipment and ductwork. Mold can grow in as little as 48 hours in an environment of high (70 percent or higher) relative humidity, such as hot, humid summer days in most

parts of the nation. Moisture helps create the mold, however materials such as duct board, insulation, dust, and other non-metal materials provides nourishment.

The good news is that mold on sheet metal duct work is easily killed with a hard surface biocide cleaner. Only EPA-registered biocides should be used, however. These biocides are designed for spraying onto hard surfaces such as sheet metal duct or plenums to kill mold and then easily wiped off. Hard-surface biocides should never be used on porous surfaces such as duct board or insulation, because they can potentially get trapped in crevices and later become airborne. This can be lethal or lung damaging for respiratory tracts.

Service contractors should beware that some hard-surface biocides at HVAC distributors have misleading information. Since the EPA only monitors container labels, some biocides manufacturers unlawfully (and immorally) tout their products as porous surface cleaners as well in a pamphlet that accompanies the container. The pamphlet allows them to fly under the radar of the EPA. Under no circumstances should a biocide be used on porous surfaces. It could literally result in life and death.

Hard surface cleaners can be used as preventative maintenance for mold as well on any metal component such as the evaporator coil, condensate pan, plenum, etc. Followed by a mold-stop product, this strategy is very effective in preventing mold.

Unlike metal duct, duct board is porous and the EPA says it should not be cleaned when mold-infested. Instead, it must be cut out and replaced. What is acceptable by EPA standards however is to apply preventative measures to duct board in susceptible areas where mold has previously occurred. The best remedy is applying a mold-stop duct sealant for porous ducts. Its coating significantly reduces the porosity where mold can harbor, plus it has a built-in biocide that discourages growth. For existing mold, mold-stop should not be applied in an attempt to contain or capsulate the area.

A good preventative strategy is spraying as much duct board as possible with a mold-stop/biocide where it meets the plenum. This is a notorious area for collecting mold-nourishing condensation from the refrigeration coil.

The IAQ Battle: Duct Board Vs. Metal

The battle of mold in residential duct systems presents an interesting question: Given the exact same condition variables (size, distance from plenum, identical relative humidity conditions, etc.) would a length of duct board attract more or less mold than its metal counterpart?

At this point there's not enough research to answer the question, but generally if a choice exists between duct board and metal for ultimate IAQ, many experts believe metal duct is the better choice. Duct board manufacturers have produced studies that claim duct board attracts no more mold than metal. While the jury is still out on mold, it's scientific fact that metal duct has less pressure drop, has a smoother surface that's less likely to accumulate dust, and is easily cleaned with a hard surface biocide if mold occurs.

Another disadvantage to duct board is the seams sometime leak over time, which could be due to aging tapes or installation error. Duct tape is not approved for any ductwork and foil tape tends not to hold as long as a mastic/cloth tape combination.

These openings created by the connecting tape's failure to adhere over the life of the duct, creates voids that can expose the cold air supply to warm humid condensation-creating conditions outside the duct. Where there's moisture, there's a good chance mold will develop. That's why the moisture source—whether it's a leaking pipe, roof or condensation-collecting void in the ductwork connection—must be rectified.

A homeowner complaining of respiratory problems should have the home's RH determined, because mold/mildew can't exist without moisture. This is accomplished with either:

1. determining wet bulb and dry bulb temperatures and calculating RH with a psychrometric chart;
2. using a humidistat;
3. documenting an extended period of RH readings with a humidity recording instrument to determine house's tendencies;

To lower the RH, the air conditioning system should be turned on. Much of this boils down to a humidistat and educating the homeowner on using the air conditioning unit to control RH regardless of whether the indoor temperature is cool enough or not. This is particularly important in summer months if the home is unoccupied for extended periods.

Setting the thermostat lower will reduce RH, but it also tends to chill the home's occupants. There are thermostat/humidistat combinations that when set for 55-percent, will run continuously until the RH set point is achieved, regardless of whether the space temperature is too cold in the house. If the occupants complain about the low temperature in the conditioned space, an air comfort solution to the chilling effect is an installed humidity control board. While not efficient this reheat control board activates the furnace to reheat the air when the space if the temperature is too chilling while achieving the targeted RH. A humidity control board is easily wired into the thermostat wiring anywhere between the thermostat and the fan coil unit and works with essentially any a/c or heat pump models.

An oversized air conditioner might be the cause of a high RH because it's not moving enough air across the evaporator coil. Its oversized cooling capacity achieves the set point room temperature too quickly (short cycling) without running long enough to circulate sufficient air across the evaporator coils to remove the humidity at the evaporator.

Another remedy for oversized a/c units might be adjusting the blower motor speed (for fixed speed units). For example, increasing blower speed will move more air across the evaporator coil, which in turn circulates more air. However if the blower speed is increased too high, the evaporator air exit temperature might be above the dew point temperature and there will be no condensation or moisture from the air. The key is to look at the evaporator air exit temperature. Once the evaporator coil is at steady state temperature, determine if the evaporator air exit temperature is below the dew point. If it is well below the dew point, increase the blower speed. If it's above the dew point, decrease the blower speed to dehumidify. Fan speed can be adjusted by moving a fan lead to a different position or using a different fan-power lead (refer to equipment instructions). The downside of increasing motor speed is the fact that fan noise increases.

There are two reasons why the HVAC contractor should provide IAQ services to their clients, the contractor's realm of the HVAC system can both create mold and also prevent it. Thus it should only be the certified IAQ/HVAC contractor that should remedy the homeowner's IAQ problems.

Bio: Robert Scaringe is president of Mainstream Engineering (www.mainstream-engr.com), Rockledge, Fla., and has been involved in the development of advanced vapor-compression heat pump systems for more than 33 years. He currently has more than 70 HVAC-related patents and more than a hundred technical publications. Mainstreams' HVAC service products division www.qwik.com has a complete line of IAQ

products including foaming coil cleaners, mold test kits, condensate line dispensers/tablets, and a humidity control board for a/c units. Also, www.epatest.com has a host of free online training with optional certification programs for contractors that include EPA-608, EPA-609, preventative maintenance, and IAQ. The newest is free training for green certification.

SIDEBAR: Checklist for IAQ

Besides checking the air handler, plenum and ducts for leaks and mold, contractors will be surprised that an IAQ checklist isn't much different than a typical annual tune-up. Add the additional check-ups and promote it as IAQ and homeowners will both appreciate the extra service as well as peace of mind that their HVAC system isn't causing health or respiratory problems. Here's a checklist:

1. **Coils:** Although it should be included with the spring check-up, cleaning the evaporator and condenser coils and changing the air filter all have a huge effect on IAQ. A suggestion for a MERV 6 filter is the treatment of PuraClean® Filter Spray. The evaporator should also be sprayed with an EPA-registered mold inhibiting hard surface disinfectant to prevent future growth.
2. **Condensate Pan:** Put a disinfectant tablet into the condensate pan to inhibit mold.
3. **Condensate Line:** Install a condensate line tablet dispenser. Since it might be one year until there's another mold check, the homeowner can easily dispense tablets every 30 days into the line to kill bacteria growth. A dispenser installation is a five-minute job of cutting the condensate line and gluing the PVC dispenser into the line.
4. **Mold:** Physically smell for mold in the HVAC system, ducts and elsewhere in the house.
5. **Ducts:** Ductwork needs a check for mold as well as leaks or signs of condensation damage, which could be an indicator of mold potential.