

INDOOR AIR QUALITY

WHERE DO WE START?



INSTRUCTOR: JOHN ELLIS

As the owner of **Dynamic Air Consulting**, I work with clients on complex indoor air quality issues; and provide in-field coaching to HVAC professionals during the discovery, design, and implementation of IAQ solutions.

I have over **35 years** in the HVAC industry, and have spent time in several industry unions, including those for sheetmetal workers, pipefitters, and the International Union of Operating Engineers.

I've served as Project Manager on large projects at hotels, prisons, water treatment plants, hospitals. And I worked a year-long pilot study for the South Coast Air Quality Management District installing and testing High Performance Filtration for schools.

Before I started my consulting company, I owned and operated So Cal Air Dynamics, a performance-based HVAC contracting company. Using a unique blend of building science and forensics, and mechanical science, my company helped create **clean, healthy, indoor environments** for clients with severe respiratory conditions and compromised immune systems.

During my career, I have held numerous certifications including:

Building Science,	Indoor Air Quality, including Radon Mitigation
Commercial Air Balance	EPA Renovator,
Commercial System Performance,	Economizer Specialist,
Level 1 Thermographer,	Quality Insulation Installation,
HERS Rater,	and BPI.

I have also been active in trade organizations such as:

National Comfort Institute (NCI); the Indoor Air Quality Association (IAQA),
And the Institute of Heating & Air Conditioning Industries (IHACI).

I am currently a **Service Trainer** for **The New Flat Rate**, providing onsite coaching to HVAC, plumbing and electrical companies.

And I teach the **Indoor Air Quality Principles Workshop** for **Amana Brand Business Academy** and **Goodman Business Toolbox**, which brings me here today.

CLASS DESCRIPTION

This session will help you address indoor air quality issues using [FIVE KEY AREAS](#) that are **already** part of our everyday HVAC best practices:

THERMAL COMFORT

HUMIDITY

BUILDING PRESSURES

VENTILATION

FILTRATION

1) THERMAL COMFORT

Controlling thermal comfort is important to indoor air quality and how our clients feel. Rooms that are too hot, too cold, or too clammy all add to the "discomfort factor".

And just as in controlling thermal comfort, airflow is paramount in how our systems function and perform.

Without airflow we have problems with the heating cycle.

Too little: we go off on high limit.

Too much: we don't have long enough run times to satisfy the mean temp loads.

In air conditioning,

Too little airflow and we can't have a complete refrigerant cycle.

Too much or too high: we have an imbalance in our sensible/latent ratio.

Therefore throw and spread from our registers can drastically affect thermal comfort. The same holds true with indoor air quality: we get stagnant pockets of unconditioned and unfiltered air causing undesirable conditions.

Airflow also controls the number of **air exchanges per hour** we have in the conditioned space.

As HVAC professionals, we are well on our way to understanding some basic principles of IAQ in what we are already doing by controlling thermal comfort.

2) HUMIDITY

Controlling humidity is huge in the world of IAQ.

Too much humidity and you have an environment conducive for microbial growth, dust mite colonies, and structure degradation. Not to mention extreme discomfort.

Too little humidity dries out the mucus membranes in the nose. Other evidence of too little humidity can be found in materials in the home, such as: dry or cracking wood veneer on cabinets and furniture. Low humidity can also cause pollutants to stay airborne for longer periods of time, and can cause high static electricity.

How we control humidity can be achieved several ways. Determining the ideal humidity comfort zone should be based on the client's needs and also the climate zone they live in. Depending who you ask, **ideal humidity is around 45%**. Anything below 30% is too dry, and above 55% is too high.

The most common way to control humidity is through the refrigeration cycle from the air conditioning system. We refer to this as the latent side of the cycle.

By speeding up or slowing down, airflow can change humidity removal. Having a system doing too much sensible work in a humid environment will create a cold and clammy situation. Adding a separate dehumidifier can often tackle tough humidity problems. Keep in mind: finding the **SOURCE** should be a priority.

In colder climates, adding humidity is common practice by adding a humidifier. As in everything we do, sizing is important. Always do your research before installing any piece of equipment.

In short, controlling humidity for our clients is a great opportunity for a solid IAQ approach when creating a scope of work.

3) BUILDING PRESSURES

Controlling building/envelope pressures is greatly misunderstood, but is totally part of our responsibility as HVAC professionals. Let me be clear: when a house or building is **being built** it is the general contractor's job to see that standards are being met as far as building tightness.

That being said, even in older homes and buildings, we can control the amount of air that enters and leaves the structure. Knowing the infiltration rates is part of doing load calculations. **1 CFM IN = 1 CFM OUT.**

When it comes to IAQ, all the filtration in the world is a wash if the infiltration rates are not addressed. So it is important to keep inside in and outside out. When a house or structure is in even a slight negative pressure the possibility of bringing pollutants from outside into the structure greatly increases.

Keep in mind, the **air is the medium on which all things travel**. With air comes: moisture, humidity, VOC's, microbials, dust, chemicals, rodent feces, and much more.

Looking at building pressures allows us to identify sources of pollutants. Of course, sealing up the structure would go a long way, but we can control the pressures a couple different ways.

Assuming we have a balanced heating and AC system, bringing a prescribed amount of outside air into the return would give you a positive pressure. But this isn't always possible, depending on what part of the country you live in (think Arizona vs. Florida).

So having a positive pressure device that both tempers and filters the air works well, like an ERV, an HRV, or a dehumidifier.

4) VENTILATION

Fresh air, or outside air as it is often called, falls under the category of ventilation and is widely overlooked as part of IAQ solutions.

The benefits of bringing in fresh air are amazing on many levels. Let's start with dilution. This is the process of diluting harmful pollutants in the house such as carbon dioxide, some VOC's, cooking odors, and pet odors, by mixing indoor air with fresh air.

Often, by diluting such compounds, we can bring the levels down to safer concentrations. Of course we would **ALWAYS** want to try and identify the source of the pollutants first and eliminate them.

Bringing in a **prescribed** amount of fresh air helps control stagnant air in a house or structure. Recirculating the same air over and over becomes a problem. In today's housing market, homes are being built tighter and tighter allowing pollutants to build up with nowhere to go.

ASHRE Standard 62.2 states if a building's air tightness gets at or below .35 natural air exchanges per hour, we must introduce mechanical ventilation.

As I stated earlier, bringing in fresh air also helps with building pressures. How we bring in fresh air varies depending on climate. Using an ERV or HRV or even a dehumidifier to bring in fresh air can be very effective. So let's put the **V** back in **HVAC** and not become **HACs**.

Just remember: keeping the whole house ventilated is a must!

5) FILTRATION

Filtration is commonly the mechanical or physical operation which is used for the separation of solids from fluids. Air is fluid, and the filter allows the fluid to pass through a medium, removing any solids.

Filters were originally installed in heating equipment simply to protect the equipment. As consumers started adding air conditioning to their home this became even more important. During the energy crisis, **homes became tighter and tighter**, and IAQ got its roots.

Consumers expected filters to not only protect the equipment but also keep the home clean and dust free. This led to the evolution of more HVAC related IAQ products, such as newer filter types: fiberglass, electro static, pleated, extended pleated, HEPA, and electronic air cleaners.

The five most common filtration methods are: straining, impingement, interception, electrostatic attraction, and diffusion. Most filters on the market today only use one or two of these filtration methods.

The benefit of using a better filter leads to improved indoor air quality. The downside: often times these filters are not designed into the system, and they can lead to restricted air flow.

Filters are designed to move a certain amount of air,
(Cubic Feet per Minute, CFM)

At a certain velocity,
(Feet Per Minute, FPM)

Through a certain size opening,
(Area in square feet)

With a certain amount of restriction to the air flow.
(Pressure Drop).

All these measurements must be taken into consideration when designing a filter into a system.

CLOSING

One last point to touch on is the "**Human Element**". When working with clients and their families, more often than not, there are heightened emotions attached to the decision needing an IAQ professional. And when children or severe medical conditions are involved, emotions **skyrocket**.

So remember they are looking for **solutions and answers**, not products, widgets or snake oil.

You must also remember that: prescription without diagnosis is malpractice.

To help you with diagnosis, just remember that:

Indoor Air Quality = I = Investigate

A = Analyze

Q = Quote

Indoor Air Quality is such a huge missed opportunity for contractors to serve their clients well. It also is the most misunderstood part of HVAC.

We have just barely begun to scratch the surface of true Indoor Air Quality. The topics today are right in our wheelhouse as HVAC professionals. This gives you a great starting point.

With additional training, tools and practice, **you can become an industry leader** in the realm of IAQ. Remember if you are not standing out, you are blending in.

So let **today** begin your journey into offering your clients the very best services in IAQ.