As Seasons Change, Indoor Air Quality Complaints Increase

Since EHSI began providing indoor air quality investigations some years ago, we have noticed trends in the frequency of indoor air quality complaints in relation to seasonal changes. Although air quality complaints are common throughout the year, the majority of indoor air quality complaints, we have learned, occur when seasons change and HVAC units go from air-conditioning to heating and vice versa. We have done inspections in many different types of buildings each with a different air handling system and found several recurring scenarios that are usually the root cause of the complaints. The following details the most common causes of the indoor air quality concerns we encounter when we are called on to do indoor air quality investigations:

• **Low Humidity** is one of the most common reasons for air quality complaints as summer creeps into fall and even more so in the dead of winter when outdoor humidity is very low. Humidity levels that remain below 20% can lead to very dry mucus membranes which are especially troubling to people with asthma or allergies. The optimum indoor relative humidity level is between 30% and 50%. Efforts should be made to ensure that humidity remains in this range as much as possible year round. In our investigations, we have found very few instances where HVAC systems were equipped with humidifiers that could add moisture to very dry outside air. Since adding moisture isn’t always a feasible option, it is important to avoid removing what moisture is in the air. Be sure to turn off all dehumidifiers during the autumn and winter months. Occasionally low humidity problems are thought to be high humidity problems because of the allergy symptoms they can cause in some individuals. We have seen multiple dehumidifiers running in areas that already had very low humidity.

Humidifiers are a possible solution for small areas but are unlikely to have a building wide impact as far as overall humidity is concerned. Energy Recovery Ventilation Equipment can not only help save a lot of money in heating and cooling costs, but also can allow greater control over humidity levels indoors. For more information go to [www.epa.gov/iaq/schooldesign/saves.html](http://www.epa.gov/iaq/schooldesign/saves.html).

• **High Humidity** is a well known aspect of southern living. Thankfully, air conditioning plays a major role in de-humidifying the indoor air making it much more comfortable. When a system doesn’t remove enough moisture and humidity rises above 60% indoors, it can lead to some problems. Relative humidity levels that remain above 60% can cause mold growth to occur on some cloth bound books, upholstery, and even walls and desks if the air circulation is poor. This could cause adverse reactions in people with asthma or allergies. High humidity also causes carpets to buckle, wallpaper to wrinkle, and ceiling tiles to sag—in other words, it makes buildings get old faster. Some of the most common causes of high humidity in buildings include:

  Dirty coils and clogged drip pans in air handlers greatly reduce the dehumidifying capabilities of the HVAC system. Ensure that all air handlers are on a preventive maintenance schedule that includes coil cleaning and filter changes.

  Poor ventilation in rooms that are below grade will allow naturally occurring moisture to build up in closets and rooms that are infrequently used which can cause mold growth to occur or prevent radon from escaping. Ensure that supply and return vents are operating properly so fresh air is constantly being introduced and moisture is allowed to escape. In some cases, vents can be installed on doors to rooms that aren’t serviced by the
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HVAC system to ensure that the moisture and other contaminants have a way to escape.

Some schools have attempted to use less energy by shutting HVAC systems down during weekends or when buildings aren’t being used. Although this sounds like a good idea, what typically happens is that when employees arrive to work on Monday morning, the humidity in the building is so high it is uncomfortable, even if the temperature isn’t too high. The HVAC unit then runs all day trying to catch up and dehumidify the air and cool off the contents of the building that heated up over the course of two or three days.

- Poor Fresh Air Ventilation is by far the most common cause of indoor air quality complaints, although the person with the concerns doesn’t necessarily realize that to be the case. Lack of fresh air and seasonal allergies are often mistaken as symptoms of mold growth. Very rarely is this the case. During our inspections, we monitor carbon dioxide and volatile organic compound levels to get an idea of how much fresh air ventilation is occurring. When fresh air isn’t introduced into a building, it can cause carbon dioxide and contaminants to build up, leading to uncomfortable and possibly unhealthy working environments. When enough fresh air is being allowed into a system, there should be between 500 and 900 parts per million of carbon dioxide in the indoor air. When there is no fresh air allowed into the system, carbon dioxide levels can get as high as 4000 ppm which does not represent a hazard necessarily but rather a total lack of fresh air. The trouble arises when chemical contaminants build up in areas like cosmetology, autobody repair, and anywhere else chemicals are used. In areas where volatile organic compounds should be present only in trace amounts, we have seen numbers as high as 20 parts per million when fresh air is inadequate. In order to ensure that enough fresh air is entering your building, consider the following:

Are your dampers working properly? Occasionally, especially in older buildings, the dampers for outside air are either in disrepair or have been closed and disconnected for years (to save energy of course). Be sure these dampers are functional and allowing adequate fresh air into the system, which is 5 cubic feet per minute per person in schools.

Several colleges have occupied old retail spaces in strip malls like drug stores and grocery stores. The existing systems, usually located on the roof, aren’t always balanced properly to provide adequate heating and air conditioning to the new offices and classrooms in what used to be one big open space. In some cases, an HVAC unit is too big for an area and while it can easily provide adequate cooling, it might not remove as much moisture from the air. In other cases, the rooftop units have never had their fresh air intakes opened. A slight adjustment to the openings has proven to reduce carbon dioxide levels indoors, resulting in fewer complaints.

In a perfect world, all of the NC community colleges would have high-tech, energy efficient systems in all of their buildings. However, since we get to occupy a wide variety of structures that were built throughout the past several decades, we have to come up with a variety of solutions to the indoor air quality issues that we encounter.

What’s the Plan?

Emergency plans and emergency equipment are something most employees are familiar with but are they ready to use them successfully? Many times when we think of emergency plans and equipment, we think first of fire evacuation and fire extinguishers, but in fact on a daily basis emergencies could be encountered that could require other emergency plans and/or emergency equipment.

Some of the other types of emergencies could be weather events, laboratory spills or splashes, medical emergencies and terrorist incidents to name a few. New college employees are given employee orientation and many safety topics are probably covered then. After the new employee orientation most employees will need additional training for work conditions, emergency plans and equipment used in their work areas.

Emergency Egress Plan - Do employees know what the fire or evacuation alarm sounds like? Do they know where the fire alarm “pull stations” are located? Do the associates know how to activate them? Do employees know where to assemble? Does your plan list other reporting requirements (i.e. call 911 or the college switchboard)? Have some or all of the employees been trained to use a fire extinguisher if it can be used safely?

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What’s the Plan? (continued from page 2)

Tell the employees to study the exit routes and become familiar with them; they may need to use them in the dark or in heavy smoke.

**Stay-In-Place Emergency Plan** - This plan could be used for severe weather events or terrorist activities. Do employees know where to go or stay in their buildings? How is the information/alarm issued for this plan? Do the employees know the “code words” and signaling methods to use?

**Emergency Eye Wash and Shower Equipment** - Employees need to know how to operate the equipment and the proper procedure to correctly flush the eyes and skin. Have associates practice the routes to the equipment they may need to travel to partially blinded.

**Medical Emergency** - Do employees know where the first aid kits are? Do employees know who is first aid trained if assistance is needed quickly? If your campus has Automated External Defibrillation (AED) equipment, have employees been trained to use it and given some “hands-on” experience? Do employees have the correct location and adequate information to direct Emergency Services to their location?

The above plans and equipment are probably in use on just about all of the community college campuses, but many colleges may also have other emergency plans and equipment.

Some other plans could be Lockout/Tagout (LOTO), Fall Protection and Confined Space Entry. Since the use of these emergency plans and equipment is usually limited to smaller groups, the training is usually very specific and conducted for the entire group. Each of the plans has an emergency response section and procedures to address any emergency. Since the employee group size is limited, this training is usually done well and the plan is tested periodically. On the other hand, since just about all employees are affected by weather events, laboratory spills or splashes, medical emergencies and terrorist incidents, the employees require more in-depth training at their work site.

OSHA requires all employers with more than ten employees to have a written plan for all of the above plans.

In closing remember:
- **Have a Plan** (written)
- **Know the Plan** (study it)
- **Work the Plan** (practice)
- **Test the Plan** (have realistic exercises and debriefing)

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**Extension Cords: Do's and Don'ts**

When EHSI does a campus safety inspection, we usually find extension cords that are not OSHA compliant (1910.334). Here are some things to look for.

**Extension cords should be inspected before each use for damage to the insulation, wires, or plugs.** The ground pin on the plug must remain intact in order to ensure proper grounding of the equipment being used. Ground pin adapters may not be used. Any extension cord that is used in a wet location must be approved for such locations.

Damaged extension cords must be taken out of service and either destroyed or properly repaired. Plugs are fairly easily replaceable, but care must be taken to ensure each wire is attached to the correct terminal of the replacement plug.

OSHA allows minor repairs to the cord and wires with “incidental” abrasions to be made with electrical tape, but there is no definition of “incidental.” At the same time, OSHA recommends against using tape for these repairs because 1926.403(a) in the construction regulations states “all electrical conductors and equipment shall be approved.” Also the taping will prevent any further inspection of the damage to see if it is getting worse (OSHA Letter of Interpretation 4-12-10).

In this case it may be best to err on the side of caution. If the cord is damaged near the ends, install a new plug at the damaged area and have a shorter but safe cord. If the damage is near the middle, install two new plugs and have two short cords.

**Portable Ground Fault Circuit Interrupters (GFCI)** should be used in outdoor or wet applications. The GFCI should be plugged into the receptacle and then the cord plugged into it. This gives ground fault protection to the cord as well as the tool you are using. Extension cords typically designed for home use should not be used at the college. These cords usually have small, 18 gauge wires that can easily overheat without tripping the circuit.

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breaker. Occasionally check your cord, and if it feels hot to the touch you should replace it with a heavier gauge extension cord.

Homemade extension cord sets are allowed if the proper electrical parts are used. This may sound petty, but we routinely find these made with a conduit style box (with knockouts) used to hold the receptacle. This is an OSHA violation and only the solid body electrical boxes should be used for this application [1910.303(b)(2)].

Power strips cannot be plugged into another power strip. This can lead to a serious overloading of the circuit. EHSI finds this situation in computer labs and office areas. When using a power strip, as a rule of thumb, add up the wattage of all the devices that have plugged into the power strip and divide by 120. The answer will be the amps that you are using. The power strip should be rated above the amp demand and so should the circuit. Most circuit breakers for office receptacles are 15 or 20 amps.

Flexible cords such as S, SE, SJ, etc. fall under 1910.305(g). Flexible cords may not be fastened to surfaces with staples or hung in a manner that would damage the outer jacket or insulation. Stapling cords also gives the appearance of permanent wiring, for which flexible cords are unsuitable. Flexible cords cannot be used through holes in the wall, ceilings, and floor or through doorways or windows. Flexible cords may not have splices or taps and must be connected to devices with strain reliefs.

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EHSI WEBEX TRAINING
(contact Allen to register)

October 19 @ 10am
Portable Fire Extinguishers

November 2 @ 10am
BBP & Hazard Communication

November 23 @ 10am
Indoor Air Quality

December 7 @ 10am
BBP & Hazard Communication

January 11 @ 10am
BBP & Hazard Communication