

Information Item

Faculty Representative to the Board of Trustees Report

Faculty Representative to the Board of Trustees
July 2019 Report
Joseph B. Ryan, Ph.D.
June 25, 2019

Update on Indoor Air Quality Issues at Clemson University

During the last Board of Trustees meeting I broached concerns that faculty and staff had regarding poor indoor air quality (IAQ) within many of Clemson University's buildings. Poor IAQ has led to both employees and students complaining about fatigue, headache and other negative health-related effects. It's estimated that nearly half of all illnesses are caused or aggravated by poor IAQ (Bernstein et al., 2008). All such cases are likely to reduce employee productivity and morale, while increasing absenteeism. Facilities reports that they have received 73 work order requests to perform IAQ analysis over the last three years for 36 campus buildings. While there are a host of causes for poor IAQ (e.g., lack of humidity control, indoor air pollutants), three basic strategies are recommended for improving IAQ, including managing (1) source control, (2) ventilation improvements, and (3) air cleaners. This report provides an overview of how the university is currently addressing each of these areas, and provides recommendations to the Board of Trustees for future courses of action to improve IAQ across campus.

Source Control

One of the most effective and cost efficient means for improving IAQ is through prevention, by eliminating pollutants at the source. Since our last meeting, the Facilities Department has developed an educational document to inform employees of actions they can take to prevent IAQ issues (e.g., proper temperature control, disposal of waste), as well as how to address existing issues (e.g., submitting work order). This pamphlet (see Appendix A) will be: (a) provided to all new employees during orientation, (b) provided to any student/employee who submits an IAQ work order, and (c) posted on Facilities web site.

Ventilation Improvements

A major cause of poor IAQ results from inadequate air exchange within a building. IAQ can be improved through ventilation upgrades to increase fresh air circulated through a building to help dilute pollutants that are generated or emitted indoors. The challenge for Clemson University is the inability of many of our existing heating, ventilation, and air conditioning (HVAC) systems to perform efficiently due to their excessive age. Currently, 286 of the 866 air handlers on campus are over 20 years old, with sixteen units being over a half century. Eight HVAC units located in Harcombe, Newman and the P & A buildings are 66 years old dating back to the 1953/54 timeframe, prior to any Board member attending Clemson University.

HVAC unit replacements fall under project expenditures. Over the past three years, the university has invested over \$6 million to address HVAC issues, and upgrade equipment and controls to improve IAQ. Upcoming capital projects that will address HVAC issues include Lehotsky, Daniel, Martin, and Long Hall. In addition, the University has HVAC projects totaling

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just over \$3 million to perform non-capital repair and renovation projects. The University's current Building Assessment Program has identified over \$50 million in needed HVAC upgrades over the next ten years. Additional annual funding is required to properly upgrade our university's aging HVAC units in a timely manner.

Air Cleaners

Maintaining air filters and fan coils is essential for good IAQ. Air filters capture contaminants and prevent the vast majority of pollutants from entering our workspace environment. Dirty filters limit airflow and the circulation of air throughout the building. Fan coils are also critical since they are responsible for absorbing the heat and humidity within an office space. When these preventative maintenance (PM) items are performed, IAQ is improved and emergency maintenance issues (e.g., leaks, pooling of water) which can lead to more costly damage are readily identified. Currently, Facilities manpower allows for cleaning fan coils and air filters located within office spaces every 4 to 5 years, opposed to annually which is recommended.

A critical issue is that Clemson University currently invests far less in PM than either our peer institutions, or the recommended industry standards. Best practices recommends 10% of Facilities annual operating budget be allocated for PM (Sightlines, 2017). During 2018, Clemson University budgeted \$1.54 million (5%) of maintenance expenditures towards PM. The university would require an additional \$620,000 investment to reach the PM level of our peer institutions (e.g., Auburn, Duke, Georgia Tech, Florida State, Alabama, Tennessee, Maryland), or \$2.2 million to attain the recommended industry standards. It is important to recognize that early investments in PM provides significant cost savings long term. While this is a significant investment, industry analytics show that every \$1 invested in PM provides a 545% return on investment (ROI) in corrective and emergency work orders, energy consumption, and employee overtime (Koo & Van Hoy, 2000). This would also reduce disruption of service, and improve system reliability. Performing an annual fan-coil cleaning for all offices within the university's 128 buildings, would require 4 additional entry-level employees and two mid-level employees. This is estimated to cost approximately \$286,000/year.

Additional Recommendation: Pro-Actively Monitor IAQ

Most mold outbreaks result from water damage (e.g., ruptures, roof leaks, condensation on pipes). When IAQ work orders are submitted, the university currently contracts with an outside company (Terracon) to perform an air quality assessment, and then waits several weeks to receive a finalized report. This process is expensive and merely reactionary to reported problem areas. Over the last 12 months, 171 individual samples were taken at an approximate cost of \$36,000/year which averages \$210 per sample. The university could take a more proactive stance by hiring personnel that could not only test reported problem areas, but also actively monitor historical "hot spots" within buildings where poor IAQ is commonly reported. Monitoring IAQ of buildings on a regular basis will help ensure issues are addressed early prior to negatively impacting our students and employees. The university already has the necessary equipment to conduct these tests since this position was formerly funded. Hiring an in-house employee to perform these tests is expected to cost approximately \$55k + benefits.

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Summary

Indoor air quality is critical to the good health and morale of our students, faculty and staff. While the Facilities department is actively engaged in addressing IAQ issues, the university's aging infrastructure coupled with historically limited investment in PM has created a consistent challenge in maintaining good IAQ across the campus. To properly address these issues it is recommended that Clemson University (a) increase university investment in PM by to attain parity with our peer institutions, (b) hire additional entry and mid-level employees required to perform annual fan-coil cleaning for all of the university's 128 buildings, (c) increase annual capital expenditures for upgrading HVAC units, and (d) hire an in-house employee to pro-actively perform air assessment tests across campus and monitor traditional hot spots. I will continue to work with the Lean Committee and its representatives from across campus to provide recommendations to help ensure Clemson University is a safe place to work for everyone. Please feel free to reach out to me if I can be of any assistance.

Respectfully,



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References

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Koo, W. L., and T. Van Hoy (2000). Determining the economic value of preventive maintenance. *Jones Lang LaSalle*.

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Indoor Air Quality Handout for Employees

DID YOU KNOW?

We hope that it is a comfort for you to know that Clemson University does not have any buildings that are classified as "Sick Buildings" as defined by the EPA *.

Mold can germinate and grow to a level that it is visible on a flat surface in as little as 24 hours.

More IAQ issues are caused by fragrances than mold. This is why Custodial prefers cleaning products that do not have a fragrance.

* https://www.epa.gov/sites/production/files/2014-08/documents/sick_building_factsheet.pdf



Additional information on mold is available at: <https://www.cdc.gov/mold/default.htm>

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Things You Can Do to Help

- **Report IAQ Issues to your BSC:** anytime you feel there might be an indoor air quality issue, let your Building Security Coordinator (BSC) know. You can find your BSC at : <https://cufacilities.sites.clemson.edu>. Click on the Building Security Coordinators button.
- **Submit a Service Request:** University employees can submit online service requests at our website: <https://cufacilities.sites.clemson.edu>. Click on the Service Request button.
- **Keep Doors Open:** keep your office door open as much as you can. It will help with air movement.
- **Set the Thermostat:** when gone for long periods of time, set the A/C to a medium temperature setting (74F).
- **Dispose of Waste Properly:** items that can't be recycled should be disposed of in hallway trash bins marked "Landfill." Make it a habit to empty any small office trash bins into the hallway container before leaving at the end of the day.



CU Facilities

CLEMSON

UNIVERSITY FACILITIES

PROVIDING A SAFE & HEALTHY WORKSPACE

INDOOR AIR QUALITY (IAQ)

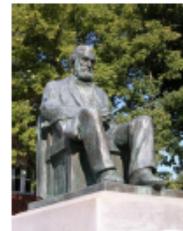
Clemson University recognizes that you are the reason we are great and we strive to provide you with a safe and healthy work space.

This pamphlet contains information on the types of issues that can affect indoor air quality and provides recommendations on how to improve IAQ.

If at any time you think there may be a problem with your work space, please contact Facilities Management.

By phone at
864.656.2186
or online at

<https://cufacilities.sites.clemson.edu/>
and use the Service Request tool.



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Potential Sources of Poor Indoor Air Quality



Things we do before you call:

Our maintenance team is in your building year round looking for potential problems. We have a special team that meets monthly to evaluate buildings and to set the priorities for future HVAC and other upgrades.

We have a team that comes through your spaces at least twice per year to change filters and they look for potential problems.

We do baseline testing more frequently in buildings that have had a problem in the past.

Things we do when you call:

Our IAQ team will come and evaluate your space. If conditions warrant it, our Third-Party IAQ tester will be asked to perform an IAQ test. If the team sees potential issues like high humidity in the room or a water leak, they will begin repairs immediately, even before the testing results are known. If we do not detect a potential problem we will wait for the test report to come back and reevaluate the situation. Either way, you will receive a copy of the test report when it is complete.

The following have been found to impact IAQ:

- **Air fresheners and perfume:** studies have shown that we can create an allergenic event for people based on the air freshener we use or perfume/ cologne we wear.
 - **Humidity:** this can be caused by water leaks around the window, fish tanks, and even too many plants or over watering of plants. Please help us watch out for these potential causes.
 - **Closed Rooms:** keep your office door open as much as you can. It will help with air movement.
 - **Temperature:** when people close up their office over the summer and leave their A/C turned down too cold, it can create conditions that encourage the growth of mold. Please leave the fan running low and the temperature at a medium (74F) level. It is also a good idea to stop by and check your office from time to time and open the doors.
 - **Plants:** they breathe life into the workspace, but potted plants can sometimes affect the quality of air in a small office—their scent, the moisture inherent to their care and the potential food source for bugs.
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- **Too Much Stuff:** paper and magazines attract bugs and create dust and mold. Please recycle magazines and books when you are done with them and don't just stack them in the corner. Even purging your files from time to time can help the IAQ.
 - **Food Waste:** food items such as fruit left out in work spaces or disposed of in office trash bins overnight can result in strong odors in small offices.
 - **Pollen:** there are times of the year that the HVAC system cannot remove pollen from indoor space fast enough.
 - **Pets:** service animals in your office can impact IAQ. If you have one, please be considerate of others who may be allergic.
 - **Smoke:** the campus is a tobacco free campus, but if you smoke away from campus the smoke on your garments could impact IAQ.